The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Entered as second-class matter, July 2, 1907, at the Chicago, Illinois, Postoffice, under the Act of March 3, 1879

Published Every Other Saturday by

Tradepress Publishing Corporation

542 South Dearborn Street, Chicago

MEMBER A. B. C. MEMBER A. B. P.

W. D. CALLENDER, President GEO. P. MILLER, Treasurer
N. C. ROCKWOOD, Vice-President C. O. NELSON, Secretary

SUBSCRIPTION—Two dollars a year to United States and Possessions. Three dollars a year to Canada and foreign countries. Twenty-five cents for single copies.

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Volume 25 April 22, 1922 Number 8

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"This Is the Best Number!"

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So whenever you read something specially helpful, tell us "more like that;" or if you miss something you believe we should have, don't hesitate to write about it. We can't guarantee to fill every order fully and promptly, but we'll try hard, and we'll certainly appreciate suggestions.

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Someone Disagrees

Mr. McCroskey's commendation of Mr. Richards' article is not the only compliment which that article received. On the other hand, one reader sincerely and heartily condemned the article. W. S. Halladay, manager of the soils bureau of the Wisconsin Limestone Co., disagrees with the author of the article. He says the principles are fine but they "won't work, at least not in Wisconsin."

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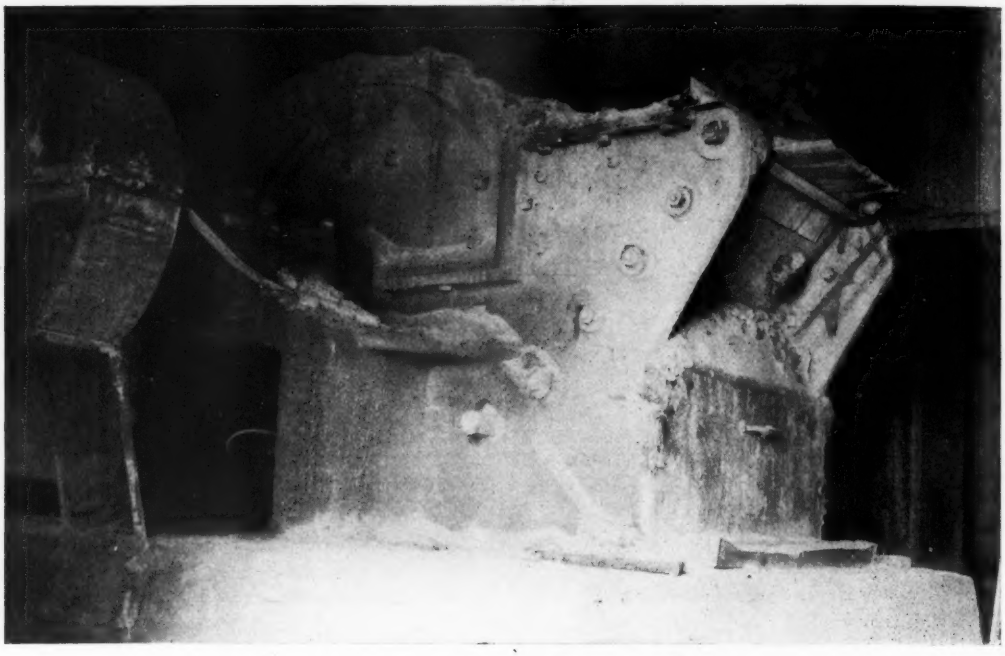
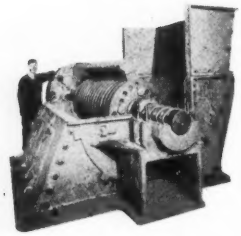


Williams Crusher installed in 1916 at the Northwestern States Portland Cement Company Plant, Mason City, Iowa



The Northwestern States Portland Cement Company of Mason City, Iowa

Charles M. Loveland, Superintendent of Western States Portland Cement Company's plant, Independence, Kans., recently wrote:

"We are putting through our crushing plant at the present from 1400 to 1600 tons per day of 9 hours, taking the rock directly as it comes from the quarry loaded from the steam shovel, reducing same to 2 inch size down to dust. The feed on the Williams mill will average from 6 inch to 8 inch size rock.

We are able to pulverize from 12,000 to 14,000 tons of rock with one set of hammers before it is necessary for us to turn the hammers, and approximately the same tonnage can be obtained the second time. Accordingly we pulverize about 25,000 tons of rock with one set of hammers before it is necessary for us to replace same with a new or resharpened set. We resharpen the hammers in our own shop by the use of a Carborundum Grinder purchased for this particular work and very satisfactory results have been obtained."

as well as the large majority of the cement plants in America, are using Williams Crushers to reduce rock and reduce costs.

Williams Crushers have, in one instance after another, reduced the number of crushing units from 5 or 6 to 1 or 2, and cut down the operating cost in proportion. The saving that this means in equipment investment and running expenses is unbelievable on any mere statement here. You have got to see the actual records and proof of performance to credit it.

Regardless of what your crushing costs are now, or what your equipment is now, if Williams can show you radical cost reductions, you are certainly entitled to know it. Write us today, and let us send the evidence.

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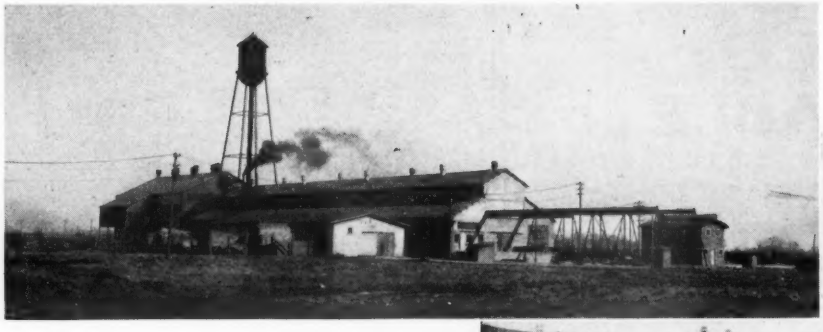
Patent Crushers – Grinders – Shredders

WILLIAMS PATENT CRUSHER & PULVERIZER CO. ST. LOUIS, MO. U.S.A. THE TRADE MARK

Western Dump Cars-



Here is a bunch of WESTERN Side Dump Cars that have already demonstrated their efficiency helping in the construction work at the new Davenport plant owned by the Western States Portland Cement Company.

These cars are also used for hauling stone to the temporary crushing plant and after the plant is erected the cars will be used for regular quarry work, thus serving a double purpose of being used in construction and supplying stone to the mill after completion.

In their selection of equipment, the Western States Company realized that quantity production requires the right kind and make. They realized that shovels must be kept moving, and that means that dump cars must be on the job, and not in the repair shop, and in scores of plants throughout the country, these cars are known for their ruggedness and endurance, for their long life, for their ability to withstand punishment.

Write for our Dump Car Catalog No. B-51 **Earth and Stone Handling Equipment**

WESTERN WHEELED SCRAPER CO. Aurora, Illinois

The Cement Industry of Iowa

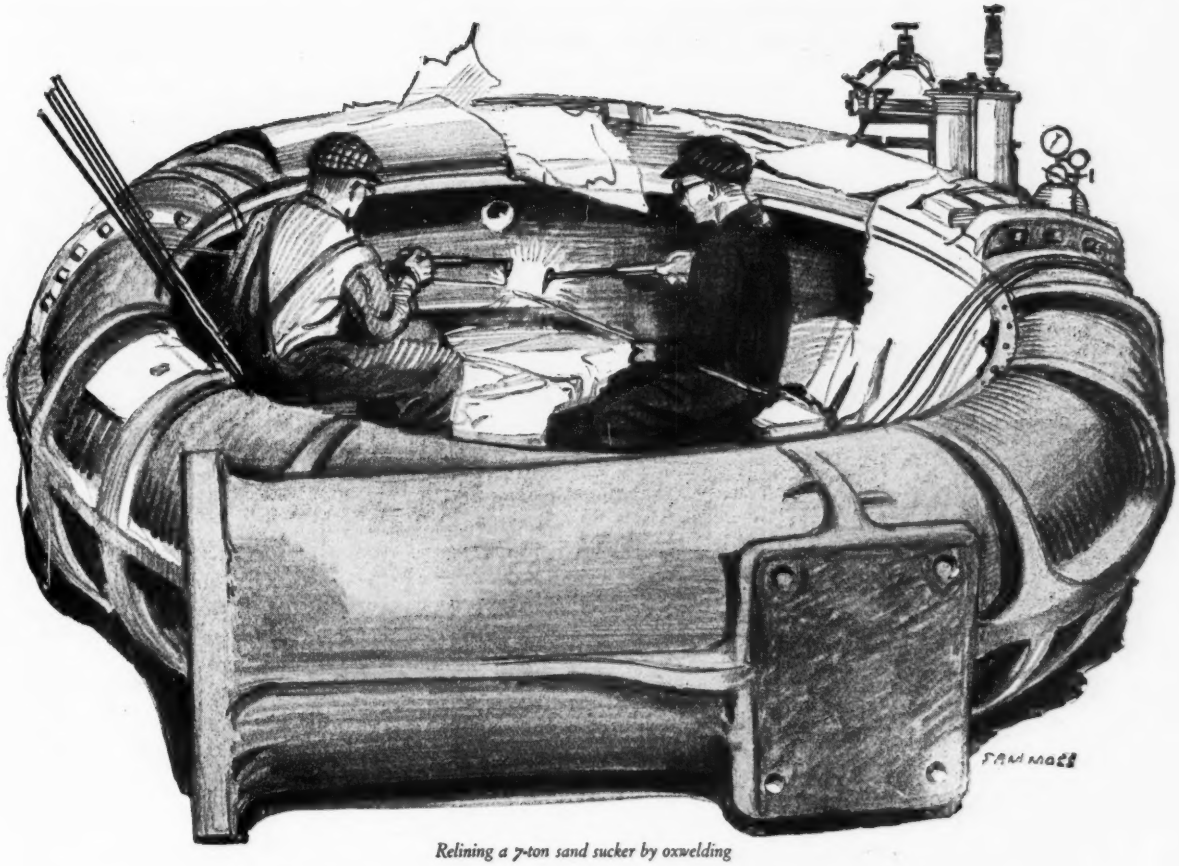
The story of the development of the Cement Industry in the Hawkeye State will be concluded in the May 6th number of Rock Products.

The continuation of this article will be unusually interesting because it will contain a description covering the equipment and methods to be employed by the two plants now under construction.

Your advertising copy for insertion in this unusual number must be in our office not later than May 3rd; and as preferred position is passed out on the "first come first served" plan, an early reservation will be found profitable.

ROCK PRODUCTS
542 So. Dearborn St., Chicago

Don't forget the date, May 6th, 1922



Relining a 7-ton sand sucker by oxwelding

Salvaging a Sand Sucker

Thousands of tons of whirling sand had scraped away the inner surface of this sand sucker until it was unfit for use.

To have replaced these 7-ton castings would have cost $3,500.00 in cash and ten to twelve weeks in time.

The oxwelding blowpipe built up the worn sections with more than half a ton of high carbon steel, in six days, at a total cost of $1,166.00.

Such is the every day story of oxwelding—saving time and money not only in reclamation work such as this but in production as well.

In hundreds of plants, making a great variety of articles, the oxwelding and cutting blowpipe are reducing manufacturing costs, increasing output and eliminating interruptions to production.

Oxweld Service Engineers, stationed in more than fifty important cities, will demonstrate how oxwelding and cutting may be used in your business to advantage. There is no charge for such service.

Write for an illustrated book "Oxweld Can Do It!"

What Oxweld has done for others—Oxweld can do for you.

An illustrated book "Oxweld Can Do It" tells what oxwelding is doing—write for it

OXWELD ACETYLENE COMPANY · *Newark, N. J.* · *Chicago* · *San Francisco*
Sales Representatives in the Principal Cities of the World

WORLD'S LARGEST MAKER OF EQUIPMENT FOR OXWELDING AND CUTTING METALS

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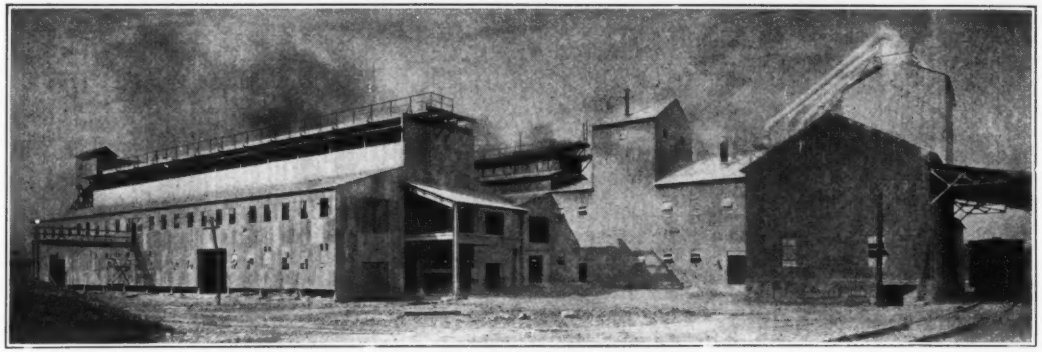

Plant of The Ohio Hydrate & Supply Co., Woodville, Ohio
(Designed by the Schaffer Engineering & Equipment Co.)

First unit built in 1917—today the second largest finish lime plant in America —and still growing

It's the Hydrate!

It is Made Scientifically in the

Schaffer Continuous Hydrator

Schaffer Continuous Hydrator

For their new addition they have just purchased another of our largest sized machines

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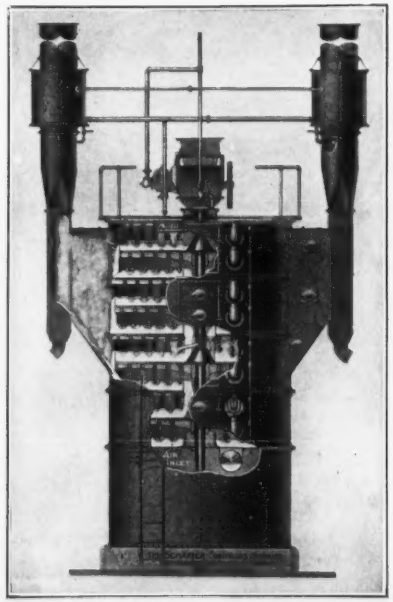
Need Anything More Be Said?

Schaffer Engineering & Equipment Co.

2828 Smallman St. **Pittsburgh, Pa.**



The Hydrator of Proved Satisfaction

The Schaffer is the Choice of Experience

Dependable blasting

YOU require more than good explosives to secure dependable blasting—all the accessories must also be entirely reliable.

We want to do more than merely serve you with good explosives, we want to help assure you successful results.

We make sure for you that the fuses, caps, exploders, batteries, wire and appliances are as good as the Grasselli Explosives for which they are intended.

You reap the full benefit of our efforts on your behalf when you use Grasselli accessories that fit the job.

The Grasselli Powder Company

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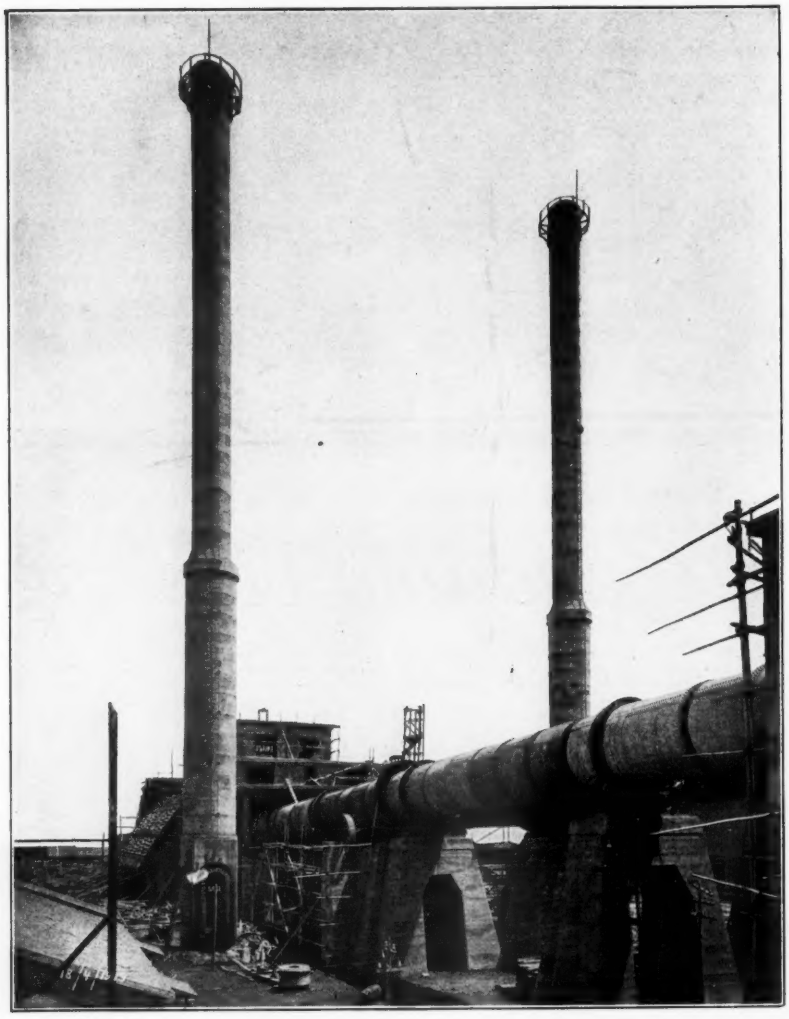

Cement Kilns, Kawasaki Plant No. 2. One of the seven plants of Asano Cement Co., Tokyo, Japan. The principal equipment for these seven plants was furnished by Allis-Chalmers Mfg. Co.

Asano Cement Company's Seven Plants
Equipped with Allis-Chalmers Machinery

Allis-Chalmers engineering experience, covering more than sixty years devoted to the design and building of heavy machinery for many varied engineering and power purposes, includes prime movers of all types among which are some of the largest units ever built, complete crushing and cement plants for large dams and irrigation projects, electrical apparatus and many complete lines of industrial machinery.

By reason of this experience the Allis-Chalmers Organization is able to propose and furnish equipment best suited to meet the particular requirements of its customers with complete equipment built by one organization, under a single supervision, the many details, complications and delays incident to divided responsibility are avoided.

Allis-Chalmers Products

- Crushing Machinery
- Complete Crushing Plants
- Cement Machinery
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- Dust Collecting Systems
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- Air Compressor Equipment
- Centrifugal Pumps and Pumping Units
- Electric Motor Drive and Control Equipment
- Power Units with any Type of Prime Mover
- Complete Electrical Equipment from Prime Mover to Switchboard
- Power Transmission Machinery
- Flour Mill Machinery
- Saw Mill Machinery
- Mining and Metallurgical Machinery
- Pumping Engines
- Tractors
- Timber Treating and Preserving Machinery

Let us figure on your requirements.

ALLIS-CHALMERS MANUFACTURING COMPANY

Milwaukee, Wisconsin, U. S. A.

Paris Office — 3 Rue Taitbout **London Office — 728 Salisbury House, London Wall, E. C.**

Above: 6,000-barrel plant of the Northwestern States Portland Cement, Mason City, Iowa.

Below: View of Edge Moor Waste Heat System, showing boilers, economizers, and stacks.

Waste Heat Carries the Entire Power Load in this 6,000-Barrel Plant

CEMENT mill operators may well profit by the experience of the Northwestern States Portland Cement Company, whose splendid plant at Mason City, Iowa, is described in the editorial section of this issue.

The entire power load of this plant, with its 6,000-barrel daily capacity, is carried by steam generated from waste heat, thus effecting a tremendous saving in fuel costs. Approximately 125,000 lbs. of steam per hour are generated.

Four Edge Moor Waste Heat Boilers of 933 H. P. each, together with special Green Fuel Economizers, Foster Super Heaters, motor-driven fans and other auxiliary equipment, comprise the Edge Moor Waste Heat System at this plant.

Although this System has been in use only since March, 1921, the greater part of its cost has already been absorbed by the savings it has effected.

Let us tell you how you, too, can reduce expenses and increase capacity with the Edge Moor Waste Heat System.

EDGE MOOR IRON COMPANY
Established 1868
EDGE MOOR, DELAWARE

New York *Boston*
Chicago *Pittsburgh*
St. Paul *Charlotte*

EDGE MOOR Water Tube BOILERS

FOR INCREASED FUEL ECONOMY

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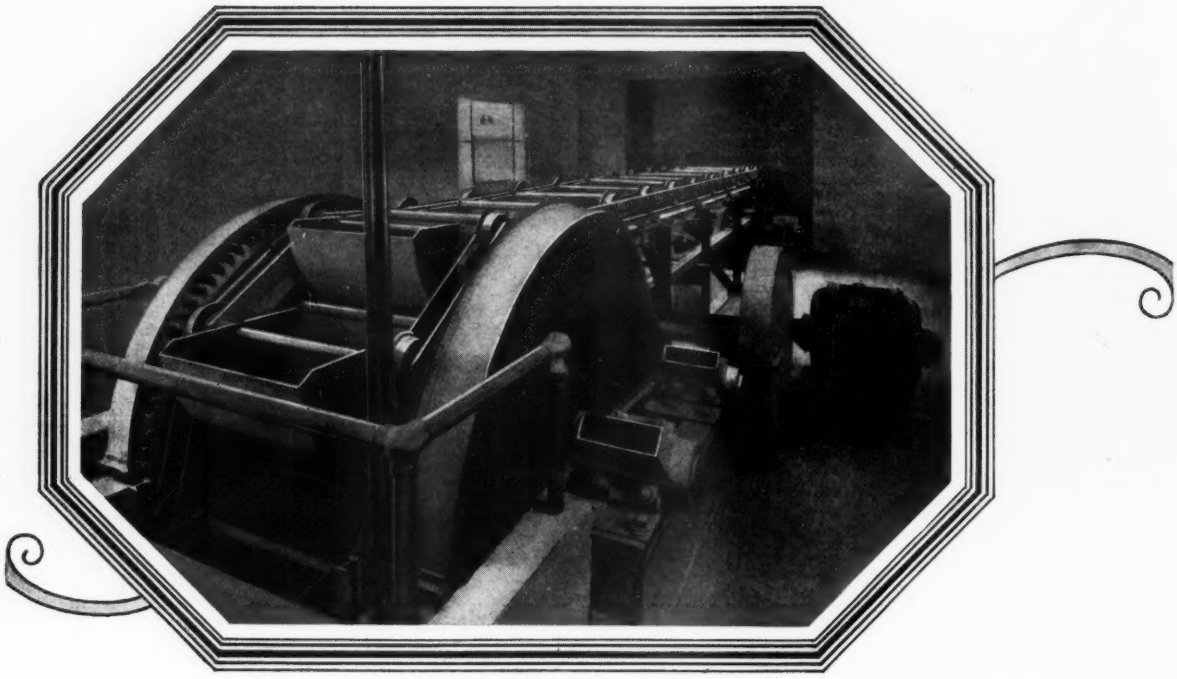


THE severe service of handling hot clinker, cement, stone, and similar abrasive materials, as well as coal and ashes in the power plant, demands a most rugged, durable and effective type of equipment.

THE PERKINS PIVOTED BUCKET CARRIER meets the requirements of this exacting service with a minimum of operating and maintenance charges. It is sturdily built and mechanically correct in design, thus insuring years of reliable and dependable service. This is demonstrated by the number of Webster installations successfully operating in cement mills today.

Webster Engineers have had years of experience in designing and building elevating and conveying machinery for cement mills. Let them suggest a method for cutting the handling costs in your mill.

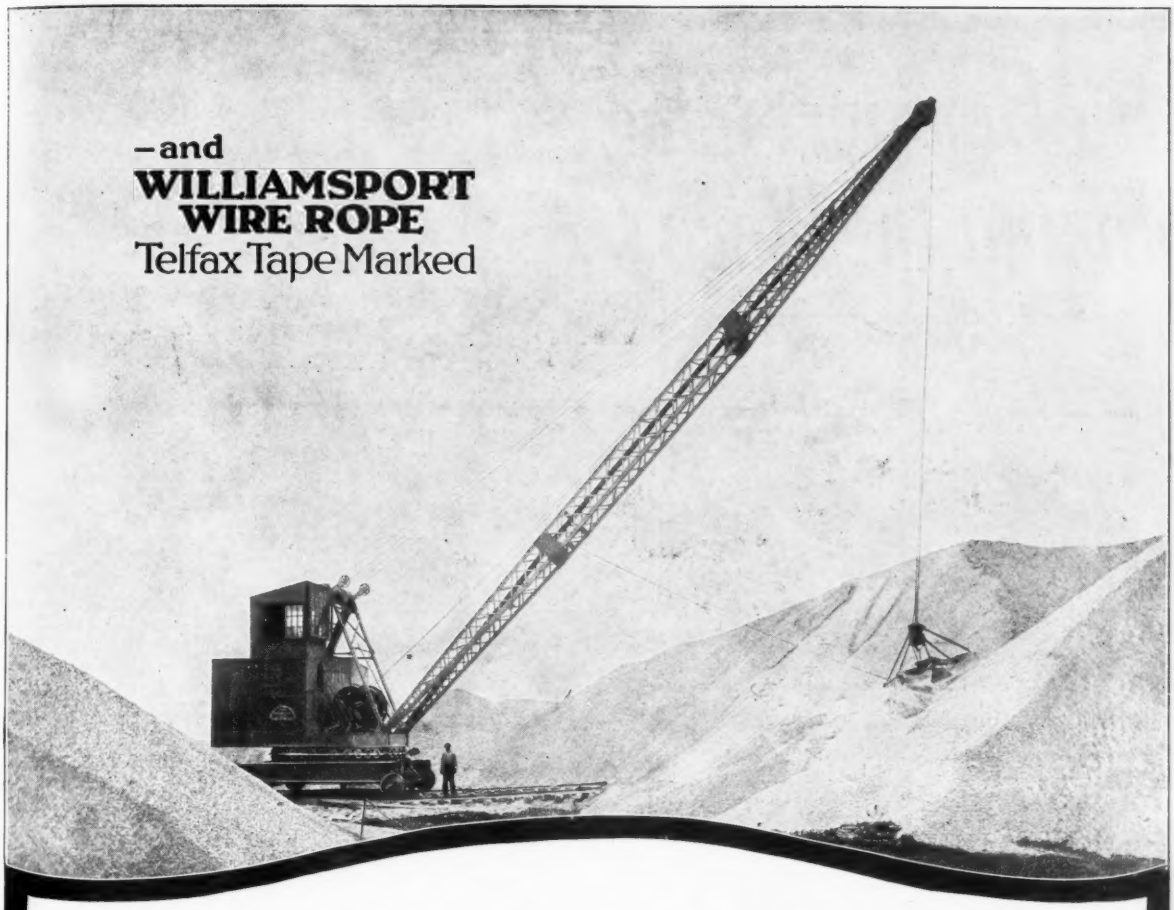
A FEW SUCCESSFUL INSTALLATIONS

Pennsylvania Cement Co., Bath, Pa.
Nazareth Portland Cement Co., Nazareth, Pa.
Southwestern Portland Cement Co., El Paso, Texas.
Crescent Portland Cement Co., Wampum, Pa.
Ogden Portland Cement Co., Ogden, Utah.
Hercules Portland Cement Co., Bellevue, Mich.
Oklahoma Portland Cement Co., Ada, Okla.
Louisville Cement Co., Louisville, Ky.

THE WEBSTER MFG. COMPANY

4500-4560 CORTLAND ST., CHICAGO

Factories-Tiffin, O. *and* Chicago - Sales Offices *in* Principal Cities



When Orton & Steinbrenner equip their mammoth cranes with

WILLIAMSPORT WIRE ROPE

—Telfax Tape Marked, they render a **distinctive** service to the user, they have spared no expense to deliver a super-quality product throughout—for there are many inferior wire ropes on the market which can be bought for much less money. And inferior **look** the same as **good** rope.

Any crane manufacturer can sell a crane, equipped with **inferior** rope or reputable rope of **uncertain** grade, and sell the unit for less than if "Williamsport" equipped.

If you want to know for a certainty the make and grade of wire rope you get, let your specifications add —"and Williamsport Wire Rope, Telfax Tape Marked."

WILLIAMSPORT WIRE ROPE COMPANY

Main Office and Works
Williamsport, Penna.

General Sales Office
Peoples Gas Bldg., Chicago, Ill.

"accepted as the best"

Rock Products

Volume XXV | Chicago, April 22, 1922 | Number 8

Cement Making in Iowa

The remarkable thing about Iowa's cement industry is its rapid progress since the first plant was built. Three plants have been added, two more are practically completed, and a seventh has just been projected. This article and a succeeding one describe the plants responsible for this progress

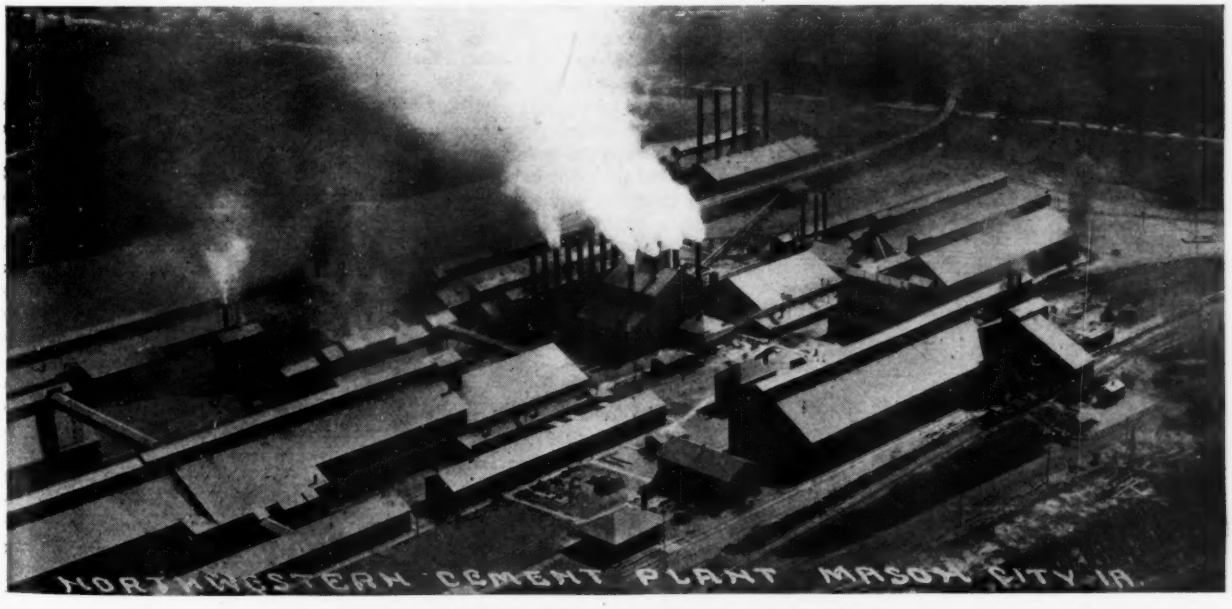
IOWA shines particularly as a great agricultural state. Her rolling prairies produce wonderful crops of corn and she is one of the leading states in stock raising. But Iowa has many important manufacturing interests and among the foremost of these is the manufacture of portland cement and various gypsum products.

The cement industry in Iowa had its birth in 1908 when the Northwestern States Portland Cement Co. was established in Mason City. Two years later the Iowa Portland Cement Co. established a plant at Des Moines. This company has since changed its name to the Hawkeye Portland Cement Co. In 1911 a third plant, owned by the Lehigh Portland Cement Co., began operations at Mason City.

The Lehigh plant is situated just across from the Northwestern plant. A fourth plant, operated by the H. Dodge Portland Cement Corp., began to manufacture cement in 1916 at Gilmore City. This company's name has since been changed to the Gilmore Portland Cement Corp. The Globe Portland Cement Co., recently organized, will erect a cement plant near Dubuque, with a capacity of 3000 bbl. per day. This plant will cost about $1,500,000. The details of this plant will be given in the second article on Iowa's cement industry

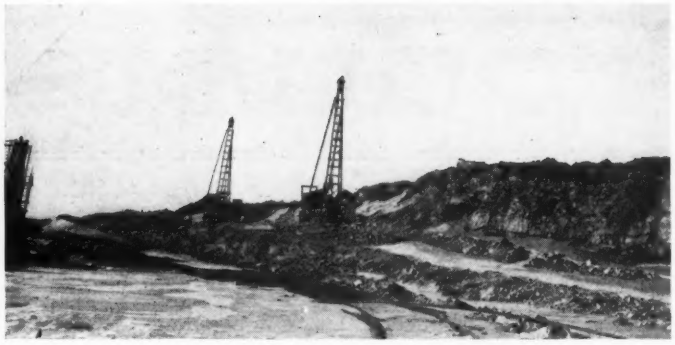
In 1911 the first three plants mentioned above produced 1,952,000 bbl. of portland cement valued at $1,881,253. In 1914 the same three plants produced 4,224,076 bbl. of cement valued at $4,008,915. This is an increase in volume of 116 per cent over a period of three years. During 1916 the production of the same three plants was 4,853,789 bbl. of cement valued at $6,165,-547, or a volume increase of 15 per cent over a period of two years.

In 1918 the Gilmore City plant was operating, and its production combined with that of the other three plants totaled only 3,626,455 bbl., a decrease of 1,227,334 bbl. since 1916. This decrease was due to war



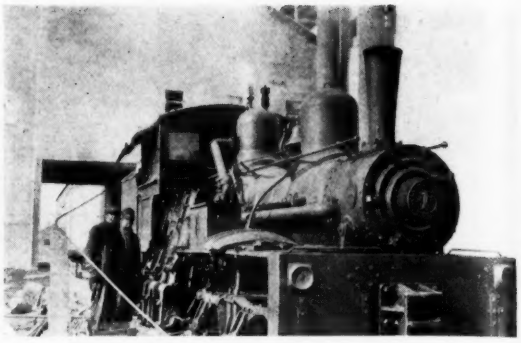
WHERE IOWA'S CEMENT INDUSTRY WAS BORN

In 1908 the Northwestern States Portland Cement Co. established its plant at Mason City, the first cement plant in Iowa. This view shows the general layout of the plant at the present time



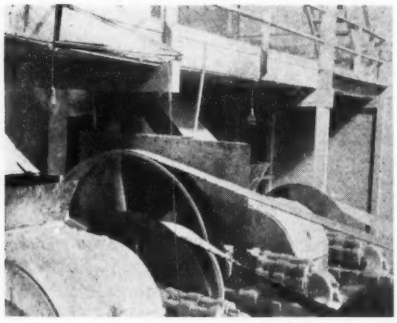
GETTING OUT THE LIMESTONE

This is a new quarry recently opened by the Northwestern company by tunneling under the railroad tracks. Two well drills are used in blast holing

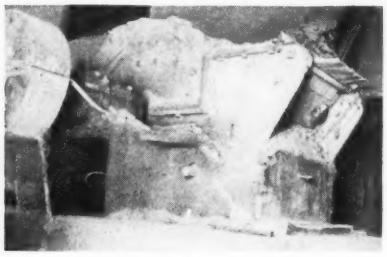


TO THE CRUSHING PLANT

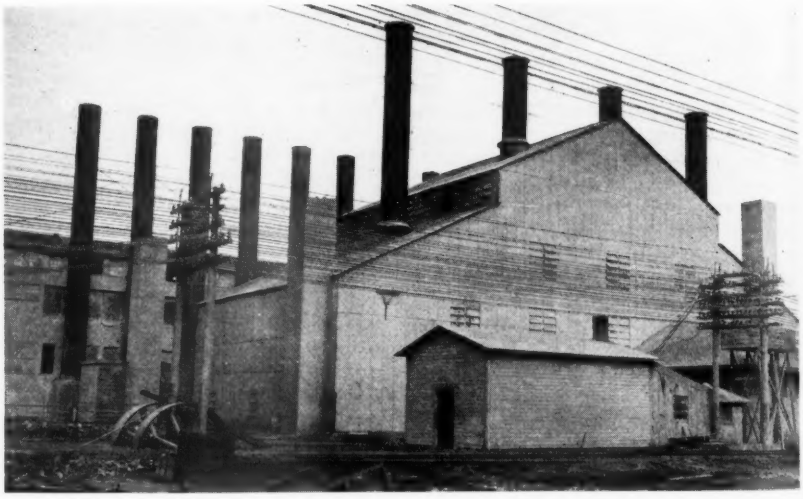
Two of these locomotives operate between the quarry and crushing plant, an average distance of 2000 ft., carrying rock in 6-yd. side dump cars



In these rolls stone is reduced to ½ in. and finer, and it then goes to driers or to storage



Stone from the driers is fed to this mill where it is reduced ready for final pulverization



WHERE ECONOMY ENTERS

This waste heat boiler plant contains four boilers of approximately 1000 hp. each, which generate more than enough power for all plant requirements by using the heat from the plant kilns. This installation was made last year

conditions. Construction and road building were at a standstill during that period, but with a resumption of these activities, in 1920, the cement industry rapidly swung into its stride and produced 4,849,228 bbl. of cement, an increase of 1,222,773 bbl. over 1918. The 1921 figures are not yet available, but judging from reports, it can be confidently expected that the past year was the biggest and best in the history of the cement industry in Iowa.

It can be seen from the above figures on production that the growth of the cement industry in Iowa has been nothing short of phenomenal. In only one instance—during the war period—was there a decline. Otherwise the production has been increasing consistently. Iowa has an abundance of raw material for manufacture of portland cement, its transportation facilities are excellent, its geographical location with respect to fuel and markets is good, and its labor supply is fair. Under these favorable conditions, production is likely to become larger and larger year by year.

At the present time two new plants are in the course of construction. One of these, that of the Pyramid Portland Cement Co., is well under way at Valley Junction, a suburb of Des Moines. The other new plant is that of the Western States Portland Cement Co., at Bettendorf, just outside of Davenport. The Western States Portland Cement Co. operates a plant at Independence, Kan., at the present time.

Cement Manufacture

The portland cement industry is a manufacture based upon chemical and mechanical processes. It is made by the burning of a finely ground mixture of limestone, silica, alumina, and iron oxide, in definite proportions. This combination is made by mixing limestone (or marl) with clay or shale; by mixing cement rock and limestone; or by mixing blast-furnace slag and limestone. The burning takes place at a high temperature, approaching 3500 deg. F., and during the burning a combination of the lime with silica, alumina, and iron oxide takes place. The product of the burning is a semi-fused mass known as clinker and consists of silicates, aluminates and ferrites of lime in certain definite proportions. To the clinker is added a certain amount of gypsum, which acts as a retarder to prevent the cement from setting too rapidly, and the mass is then finely ground. The resulting powder is portland cement; it must be uniform in both composition and quality.

The manufacture of portland cement has become a highly specialized business, and the plants in Iowa are utilizing the

best and most modern types of cement-making machinery.

Northwestern States Plant

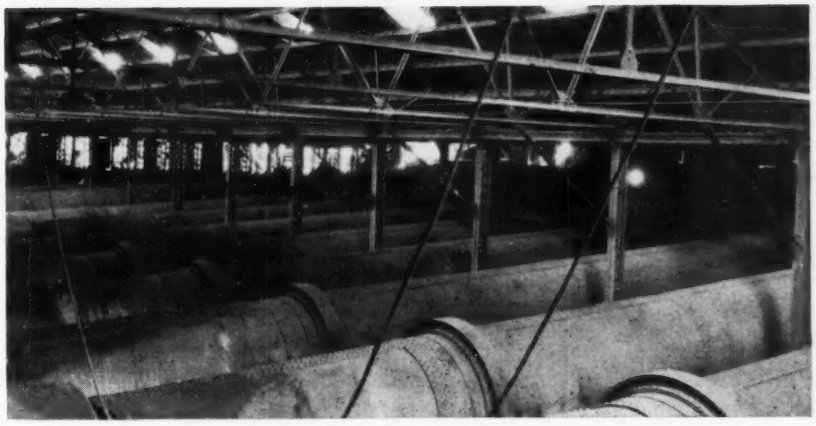
The Northwestern States Portland Cement Co. established the first mill in Iowa at Mason City in 1908. Since that time this plant has undergone few changes other than additions to the plant, until last year when several improvements were made. At the present time it is the largest mill in Iowa and one of the largest individual units in the country, its capacity being 1,000,000 bbl. of cement annually.

The ingredients used for cement manufacturing at this plant are limestone and clay and are found adjacent to the plant site. The quarry contains a high calcium limestone and it has been worked all the way to the edge of the plant premises. Since the beginning of operations the company has dug out over 75 acres of quarry land and just recently a new quarry was opened by tunneling under the railroad tracks.

The quarry face has both vertical and horizontal seams and the rock comes out easily with very little blasting. Only 1 or 2 ft. of overburden has to be removed, and this is done with a Model 31 Marion shovel with a 1-yd. dipper. When not in use for stripping, the shovel is converted into a crane equipped with a clam-shell bucket and it is used for loading and other jobs around the plant. Quarry drilling is done by three well drills of the company's own manufacture.

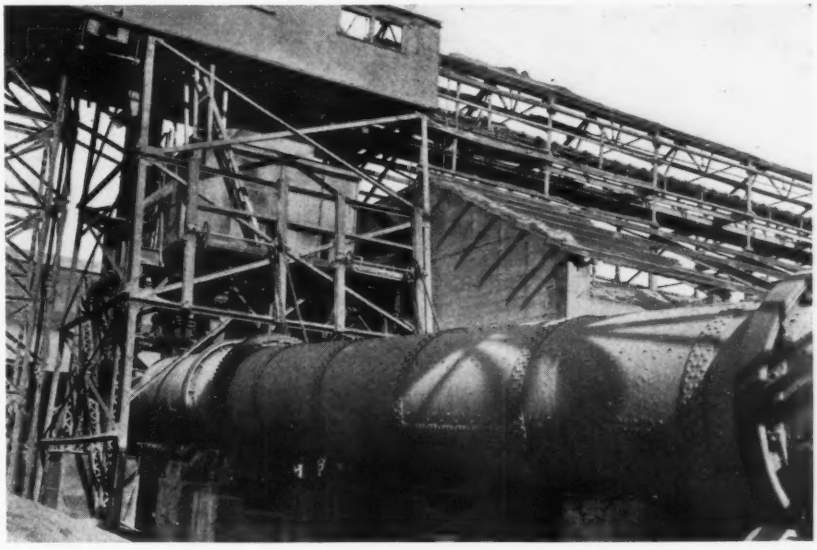
The rock is excavated and loaded into 6-yd. side-dump cars by another steam shovel equipped with a 3½-yd. dipper. When a number of cars have been loaded, a train is made up and it is hauled to the crushing plant by either two geared locomotives or two saddle-tank locomotives which ordinarily haul clay and do switching in the yard. The average haul from the quarry to the crushing plant is approximately 2000 ft.

The cars from the quarry approach the crushing plant on a trestle and are side-dumped into a hopper feeding a No. 24



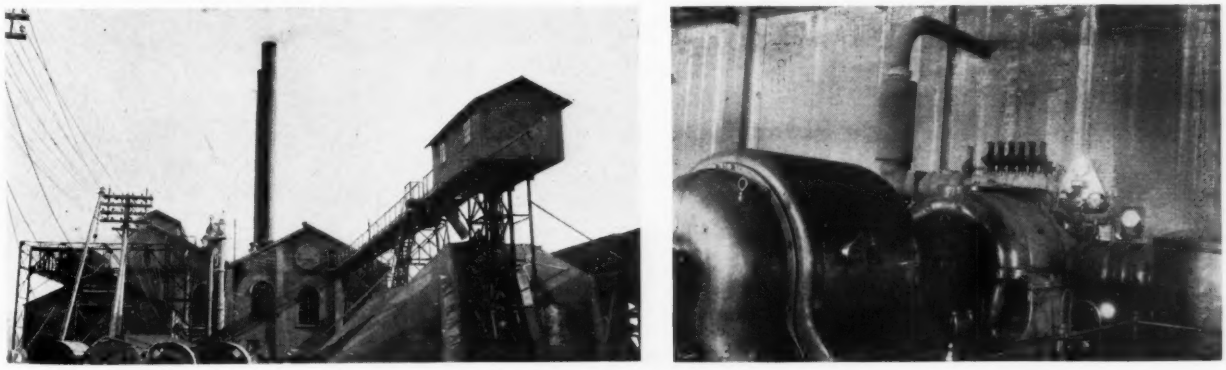
WHERE THE RAW MATERIAL IS CALCINED

Separate tanks connected with each of the 12 kilns feed material to the kilns shown here, burning it to the form of clinker. Ten of the kilns are 7x110 ft., and two are 8x110 ft.



COOLING THE CLINKER

Two 6x70-ft. rotary coolers like this one are so arranged that they can take clinker from the kilns direct or from the clinker storage, as the immediate requirements demand. From the coolers the material goes by means of conveyors to the finish grinding department

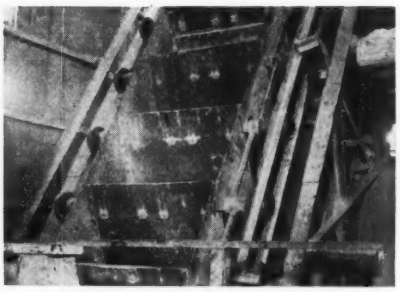


HOW THE PLANTS ARE KEPT RUNNING

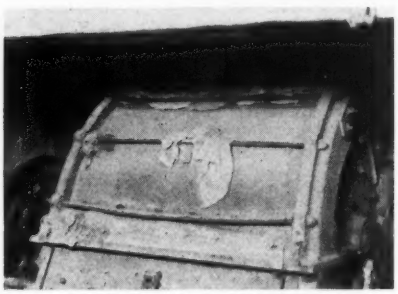
Here are some of the pieces of power equipment. At the left is the power plant, with the old boiler house, and at the right is a mixed pressure Curtis horizontal turbine direct connected to a 2500-kw. generator

THE SECOND OLDEST IOWA PLANT

This plant of the Hawkeye Portland Cement Co., at Des Moines, has been in operation for 12 years, and has a daily capacity of 3800 bbl. The quarry is 30 miles from the plant, so rock is stored in the pile shown, which has a capacity of 30,000 tons



This 54-in. bucket elevator reclaims stone from the initial gyratory crusher at 300 tons an hour



This mill takes stone from the bucket elevator above and reduces it for the kominuters

Two gyratory crushers are ready for use if the mill above breaks down

gyratory crusher. This crusher is the latest addition to the crushing plant and was installed in February of this year. The rock after passage through the crusher is reclaimed by a bucket elevator and fed to a No. 9 gyratory crusher for secondary crushing. Another bucket elevator takes the product of this crusher and feeds it to two No. 6 gyratory crushers which further reduce the rock to 2 in. and finer. The product from the No. 6 gyratories is discharged direct to two sets of 40 x 36-in. rolls, where a reduction to ¼ in. and finer is made.

Encircling the stone crushing, drying, and storage building is a McCaslin bucket conveyor arranged to discharge to bins over the driers, or direct into the storage. The top run of the conveyor is in the roof of the building and the bottom run in a tunnel under the rock storage. The stone from the rolls is discharged into the bottom run. Thus, the driers can be fed from the rolls or from storage. The storage capacity is 20,000 tons of stone.

There are two driers, 6 x 70 ft., of the direct-fired type. The furnace is at the lower or discharge end and the hot gases pass through. The stone is fed to the driers through oscillating-type feeders. After passage through the driers the stone is discharged to a screw conveyor which delivers to a bucket elevator feeding a No. 6 Williams mill. The product of this mill is elevated and deposited in bins over a battery of eight Krupp ball mills which reduce the stone so that 50 per cent will pass a 100-mesh screen. The product from these mills is delivered to the bins over the mixing hoppers, where proportionate amounts of limestone and clay are mixed for passage through the kilns.

The clay fields are located about 1½ miles from the plant. Clay is loaded into 6-yd. side-dump cars by a Browning locomotive crane with a ⅞-yd. dipper. Clay trains run to the plant and up on a trestle, where the cars are dumped into the bins from which clay is drawn for raw mix. The clay storage has a capacity of about 32,000 tons of dried clay.

The clay from the storage bins is fed on a belt conveyor which discharges two 9-ft. dry pans, where the clay is ground. It is reclaimed from the dry pans by a bucket elevator and discharged into bins ahead of the three clay driers. The clay driers are the same as the stone driers, 6 x 70 ft. The discharge from the driers is reclaimed by elevators and deposited into bins at the raw mix station or the clay goes into one or the other of two clay storage bins.

At this point the chemist determines the proportionate amount of materials in order to obtain the proper raw mix. The ground stone and finely divided clay are stored in adjoining bins. From these bins the materials are spouted to a hopper mounted on scales. A certain amount of clay is run in first and the proper amount

The man who keeps things running—Helmuth Krarup, superintendent at the Hawkeye plant

of stone follows. The attendant can see the poise of the scale but cannot tamper with the weights. At this point absolute accuracy is necessary.

The clay and stone from the scales are discharged to a 5 x 22-ft. tube mill arranged with internal paddles which is used only for mixing purposes. The product from the mixing tube mill is discharged to a screw conveyor and elevator and fed to a battery of fourteen 5 x 22-ft. tube mills for raw grinding. The product of the tube mills is fine enough so that 95 per cent will pass a 100-mesh sieve, and it is carried by screw conveyors and elevators to tanks feeding the kilns. Each kiln has a separate tank feeding it.

There are 12 kilns in all, 10 which are 7 x 110 ft., and two which are 8 x 110 ft. All kilns, driers and coolers, with their supporting and gear beds, were designed

in detail by the cement company's engineer, who also designed and had charge of constructing the entire cement plant. In the kilns the raw mixture is calcined and after the carbon dioxide is driven off, the acid and basic constituents are fused, forming tri-calcium silicates and other compounds having a hydraulic nature. The necessary temperature for burning is obtained from pulverized coal.

Clinker from the kilns discharges to the bottom run of a McCaslin conveyor which takes it to the clinker storage, having a capacity of 70,000 bbl. This conveyor encircles the whole kiln building and clinker storage. Another conveyor encircles the clinker storage only and transports the cold clinker to the finish grinding building. On the way to the finish grinding building the clinker goes through two 6 x 70 ft. coolers, so arranged that they can take the products direct from the kilns or from the clinker storage.

The conveyor delivers the material to the finish grinding building and deposits it in hoppers over a battery of 11 "Maxecon" mills. The product then is passed through Newaygo separators. The coarse material is returned for regrinding and the fines pass on to the gypsum station, where this final element to the finished cement is added. It is then conveyed by screw conveyor and elevator to tanks over the 16 finish tube mills. These are 5 x 22-ft. tube mills, and 80 per cent of the discharge will pass a 200-mesh sieve. This is finished portland cement which, by a combination of screw conveyors and elevators, is conveyed to the warehouse, which has a capacity of 410,000 bbl.

Screw conveyors in tunnels under the warehouses reclaim the cement, and with bucket elevators and screw conveyors it is carried to the bins over eight valve bag packers. The packers are four-tube machines and the capacity is 12,000 bbl. of cement in 10 hours ready to be shipped daily. Adjoining the packing room is the sack storage and sack repair room.

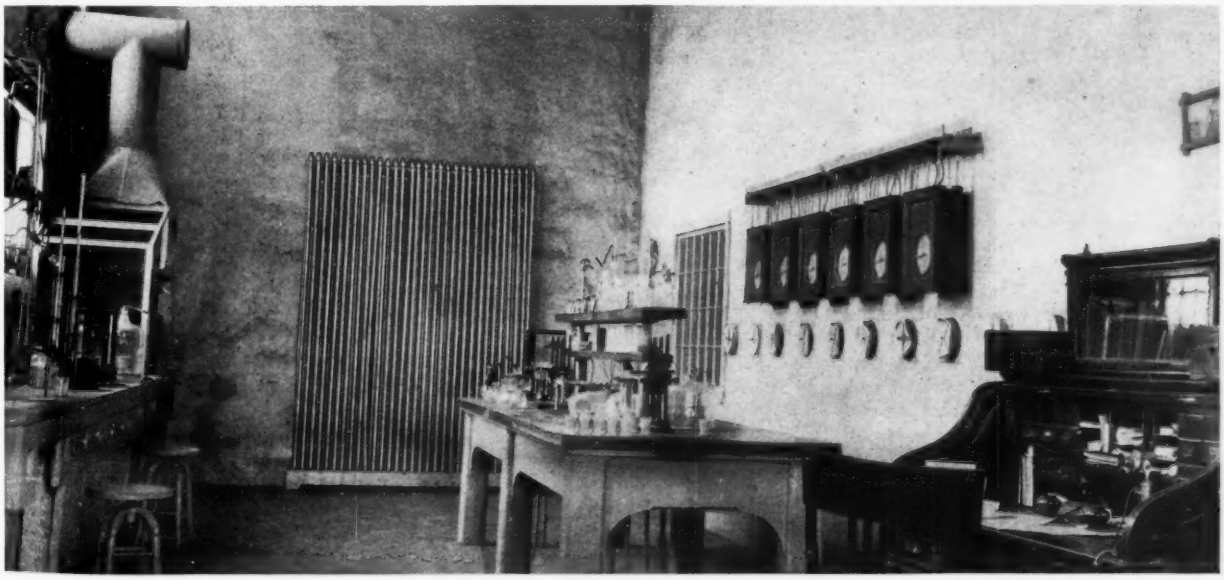
Coal for use in the driers and kilns comes into a separate coal building and is discharged through a track hopper into an 18 x 24-in. bucket conveyor, which discharges the coal into hoppers over the coal driers or direct to the coal storage which is capable of storing 10,000 tons of coal. The same conveyor reclaims from storage also. There is outside storage room for 50,000 tons of coal, and due to the possibility of an impending strike there was on hand 40,000 tons of coal in March.

The coal is dried in two Cummer driers, 54 in. x 40 ft., equipped with automatic stokers. The discharge from the driers goes to a screw conveyor and elevator and by this means is fed into a 24 x 30-in. Jeffrey hammer mill. From here it is conveyed to hoppers feeding a battery of six Raymond mills, three of which are four-roll and three five-roll machines. The coal is pulverized to an impalpable powder and then conveyed to pulverized coal bins ahead of the kilns. The pulverized coal is drawn out of the bins by screw conveyors and with coal injectors and blowers it is blown into the kilns. The fine coal dust burns like gas, with a flame, the physical and chemical character of which is under regulation.

In 1921 the Northwestern States Portland Cement Co. installed a waste heat system and it is at the present time harnessing enough waste heat from its kilns to more than run the entire plant, effecting a saving of approximately 200 tons of coal a day. The waste heat flue is located between the kiln building and the boiler house. The flue connects with each kiln housing. There are four boilers for generating steam with waste heat. Each boiler has 9,333 sq. ft. of heating surface. This is a total of approximately 4000 hp. These Edgemoor boilers are equipped with Foster super-heaters, Green economizers and Green radial flow fans, which are belt driven from variable speed motors.

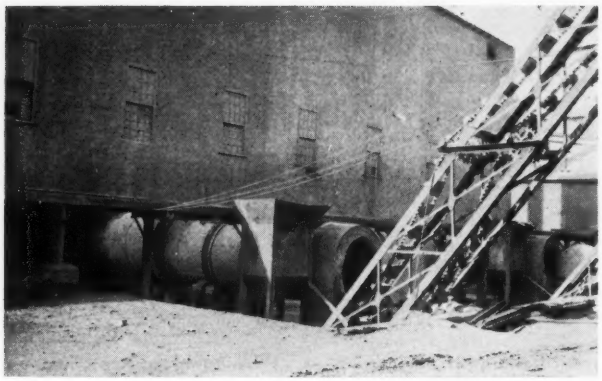
The power plant proper consists of ten

Chief Chemist J. L. Mandia and his assistant, who check each step

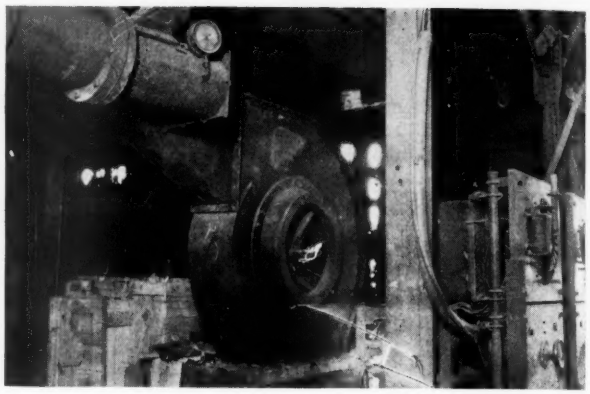


DELICATE CONTROL IS NECESSARY

Here is the chemist's laboratory at the Hawkeye plant, showing some of the apparatus needed to make sure that the proportions are always right and that every bit of product is satisfactory as it is made



From these clinker coolers the conveyor shown takes the clinker to 13 steel storage tanks which have a total capacity of 50,000 bbl., or to open storage which will hold 100,000 bbl.



Coal is mined on the plant site, crushed, pulverized, and blown by six fans like this one into the six kilns of the plant. Waste heat boilers are being installed

320-hp. water tube boilers, which are now used as auxiliary equipment only, since the waste heat boilers furnish more than the required amount of power. Three 1000-kw., 25-cycle, 600-v. generators are driven by three 1200-hp. cross compound condensing steam engines, respectively. The exhaust from these is sent to a mixed pressure Curtis horizontal turbine direct connected to a 2500-kw. generator also of 25 cycles, 600 v. Two air compressors, one steam driven with a capacity of 1000 cu. ft. of air per min., and the other one, which is an Imperial No. 10, with a capacity of 750 cu. ft. of air per min., furnish the compressed air necessary for all operations.

The president and general manager of the Northwestern States Portland Cement Co. is C. H. MacNider, father of Hanford MacNider, commander of the American Legion. Other officers are: vice-president, A. F. Frudden; secretary, F. G. Ray; treasurer, F. E. Keeler; engineer, W. J. Maytham; superintendent, F. E. Smith; chemist, G. S. Blackmore.

Hawkeye Cement Plant

The Hawkeye Portland Cement Co., at Des Moines, is the second oldest plant in Iowa. It has been in operation now for 12 years. The original design and construction were furnished by the Hunt Engineering Co., of Kansas City, Mo., and at that time it was operated as a semi-dry plant. Since then the plant has been redesigned by the F. L. Smidth Co., New York City, installing kominuters and tube mills, putting in the wet process, etc.

The quarry of the Hawkeye Portland Cement Co. is located 30 miles west of the plant on the Chicago, Rock Island & Pacific Railroad. For well drilling three drills are used and for excavating and loading rock two steam shovels are employed, a Model 91 Marion and a No. 70-C Bucyrus. The rock is loaded into regular open-top cars and hauled to the plant for crushing purposes.

At the plant the gondola cars are put on a 40-ton car dumper which hoists the cars up to the level of the initial crusher and dumps it into a No. 18 gyratory crusher. This crusher has a capacity of 300 tons of stone per hour. From the crusher the stone is reclaimed by a 54-in. pan conveyor which discharges to a No. 6 Williams mill. A belt conveyor reclaims the stone from this mill and with an automatic tripper distributes it to the stone storage over a trestle. This storage holds 30,000 tons of stone. In case the mill should break down, two No. 8 gyratory crushers are provided for secondary crushing. The same belt conveyor distributes the stone to storage. An adequate shale storage is also provided for.

The stone from the storage is reclaimed by tunnel conveyor and elevated to bins ahead of the kominuters. Here the stone and the clay, which have been previously added, are ground wet and the resultant slurry passed to a separator. The fines go to the tube mills, while the coarse material goes back to the kominuters for regrinding. There are three kominuters and two tube mills.

The slurry from the tube mills is discharged to eight slurry tanks 15 ft. in diameter by 40 ft. in height. Here the slurry is tested for its chemical contents and portions of various tanks are discharged to three other slurry tanks equipped with agitators. From here it goes to the kiln feed tanks.

There are six kilns 8 x 125 ft. followed by three coolers 6 x 60 ft. The clinker from the coolers is reclaimed by inclined bucket elevators and discharged to a battery of 13 steel tanks, each 15 x 32 ft., the entire battery having a storage capacity of 50,000 bbl. Besides, there is an open storage capable of holding 100,000 bbl.

The finish grinding department is similar to the raw grinding department and consists of three kominuters and two tube mills. Gypsum is added to the clinker, and after final grinding the cement is conveyed to the warehouse, which holds 225,000 bbl. of finished cement. The sacking equipment consists of five 3-tube Bates valve bag packers. The capacity of the plant is 3800 bbl. daily.

The coal is mined right on the plant site and is delivered to a 3000-ton coal storage. It is drawn out of storage by tunnel conveyors and deposited to two No. 2 Williams mills for initial crushing, conveyed to bins ahead of a battery of four driers, and then elevated and conveyed to five 42-in. Fuller mills for pulverization. It is then screw conveyed to bins ahead of the kilns, from which it is drawn out and blown into the kilns by six fans.

The company is at the present time installing a waste heat system which will consist of three 800-hp. Edgemoor waste heat boilers equipped with Foster superheaters, Green economizers and Terry turbine-driven fans. As soon as this is installed the company hopes to generate all its required power, and the old boiler room, with seven 360-hp. Heine boilers, will be used as auxiliary equipment only.

The kilns are equipped with six Brown indicating pyrometers located on the kiln floor and six Brown recording pyrometers located in the chemist's laboratory. A very complete machine shop and storeroom is another feature of this plant.

The organization and personnel of the Hawkeye Portland Cement Co. is as follows: President, L. C. Colman; vice-president, L. F. Crofoot; treasurer, C. W. Hull; secretary and general manager, C. B. Condon; superintendent, Helmuth Krarup; and chief chemist, J. V. Mandia.

In the next issue of ROCK PRODUCTS this description of cement plants in Iowa will be completed. The second part of the account will cover the plants not described in this issue.

Selecting a Grinding Medium for the Tube Mills

By Newton L. Hall, Salt Lake City, Utah

An interesting study of designs intended to produce economical and efficient mill products. The most effective grinding is produced by balls of irregular shapes rather than the indented shapes

VARIOUS types of balls have been used for ball and tube mill grinding in the effort to secure a grinding medium which is both economical and efficient in producing a superior mill product. The shape and form of the ball can be made effective in producing an improvement of the product, within certain limits, but to secure these benefits a close attention to mill operation is required.

The Best Grinding Medium

The best grinding medium for a ball or tube mill is a number of small parts of light weight to the load rather than a few parts of greater weight. When the cylindrical mill was first used several designs were proposed, using solid cylindrical rolls, freely tumbling within the mill load. Other designs used a series of concentric rings rolling loose within the mill and revolving with it. The use of a concentrated, heavy weight within the revolving cylinder is objectionable, for then the pulp within the mill is never distributed uniformly and consequently the heavy grinding cylinder is constantly altering its position. This unbalance affects the power requirement by varying the position of the load as well as by interfering with a uniform crushing effect.

The best grinding medium is composed of small parts, which are freely tumbling, and, for extremely fine grinding, are indiscriminate in their action. The objective of securing the effect of weight in the load should be centered in a collective weight of the load rather than in an attempt to concentrate the weight of any part of it.

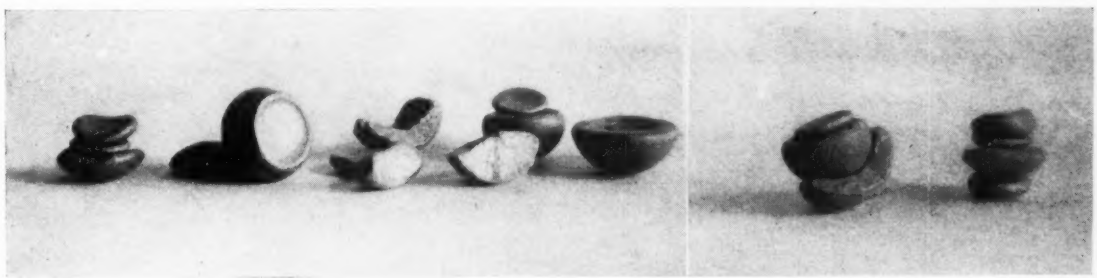
In considering any grinding medium, such as balls or slugs, it is impossible to define the load action taking place within the mill as being one of attrition or of impact grinding; the ideal action will secure a composition of these effects. The effective action of a grinding medium is closely related to the comparative and specific weight of the parts of the load. The pebble of light weight has been supplanted by the heavier steel ball which provides a better and more economical grinding effect. The time of crushing is likewise reduced.

In a series of tests made to record the rise of temperature in wet pulp as it passed through the mill—that is, to determine the difference in temperature between the feed and the discharging product—the results secured closely conformed to the effective crushing of the mill load. Three mills operating on wet ore with 3-in. cast-iron balls gave an average temperature increase of 8.2 deg. C. to the circulating load, whereas a similar circulating load in passing through a mill, using dense quartzite pebbles for a grinding medium, gave a temperature increase of only 4.8 deg. C. The power requirements were proportionately greater for the mill using the cast-iron balls, but the crushing effect was likewise more extensive, particularly in the production of extreme fines.

The pebbles for this test were quarried as 2 and 3-in. cubes from a hard, tough and close-grained quartzite. As long as such a pebble retains a cubical shape it does not produce effective grinding. A new load requires at least two weeks of action before the cubes are worn at the corners to a true dice shape. Then such a ball or pebble gives good service, but it never produces as economical grinding as a cast-iron or steel ball.

Cast-Iron Balls Are Defective

Cast-iron balls are cheap—in terms of power and effective crush they are cheaper than pebbles—but they are subject to blowholes while formed during casting, and they crack easily. Naturally a ball which does not crack gives a longer service. Eliminating blowholes during casting and securing a hard and tough iron ball depend upon foundry skill. When a perfect sphere is under a cooling process the development of cooling produces internal stresses from successive contractions. A ball so formed has the characteristic of cracking on lines which radiate from a central point. This characteristic has been overcome in foundry practice by avoiding a ball which is a perfect sphere, or of one diameter—that is, distorting it so that the shrinkage stresses do not concentrate to a central point. Deformities during the wear of the ball are caused by gasholes, an imperfectly filled mold, or soft spots in the composition.



Worn and deformed cast-iron balls showing the similarity of the deformities of the different sizes. These balls were originally of one size

Steel Balls Hold Their Polish

Another point of observation is, that special steel balls, when dumped from a mill, will hold their polish for days, while a cast-iron ball in the same load will rust within a few hours. The chemical action shown by the excessive rusting of the cast-iron ball is quicker while under mill action, therefore one is warranted in specifying that the ball composition must be slow to oxidize. Most of the alloyed steels can conform to this situation.

The majority of forged steel balls wear and reduce in size as perfect spheres, while cast balls are notably irregular in shape—not bumpy but out of proportion. As the mills which develop the most effective crushing do not show a ball load of absolutely perfect spheres, there is no justification for believing that a perfect sphere is required.

Effect of Mill Speed on Wear

While a variation of mill speed can change the shape into which a ball will wear, in general there is a peculiarity about the wearing of balls which is governed by one condition. or example: When using 3-in. cast-iron balls, a blowhole or soft spot near the surface will show wear, as an indentation or cup, and this depression will have a radium which is also the radium of the original or predominating ball. It will maintain this radius in regular progression as the ball continues to wear, therefore the concaved and convexed portions will be progressively similar. The rim of a cup or depression will not so wear as to decrease the depth of the cup, but the cupping will progressively exist under the original governing radius and continue until the ball becomes a dished disc which will crack eventually and disappear while under load action.

The accompanying illustration shows a loading of balls which were 3 in. in size originally. The selections made are exceptions, or freaks, of the load and are used here only to illustrate the general similarity of the radii of the various deformed and dished shapes regardless of the size to which the ball has worn.

At first sight, the apparent nesting of a group of concaved balls would seem to be desirable in order to secure the best crushing effect. In practice, however, it is apparent that two balls, concaved and convexed, seldom act with a mortar-and-pestle effect, for in cascading within the mill the predominating peculiarity of the falling balls is that they are indescriminate in their action. Freely tumbling balls do not nest in a load while under action. Balls with concavities, special shapes, slugs, etc., are evidently best suited for dry grinding, but in wet grinding the deformed sphere is superior. The conditions of wet and dry grinding seldom prove to be similar.

The mills which produce the most effective grinding have a ball load composed of balls of irregular rather than indented shapes. When a ball is concaved, the area of the concavity is removed from its effective position for crushing, therefore it is safe to say that the surface of a grinding ball should never be in concavity; always in convexity, to some extent. As the ball advances in the cascade it should always present an increasing surface to its surroundings, and in passing it should preferably act as a sliding heel.

As a ball of egg or parabolic shape has a variety of dimensions, its contraction during the cooling process does not produce internal stresses which radiate from one central point. Again, its advance always presents an increasing surface and one that is devoid of indentations; it has a sliding rather than a rolling motion; it presents a heeling surface, and, due to its lack of mobility compared with a sphere, it retains a high crest to the cascade of the load by reason of its increased angle of repose.

Advantages of Forged Steel Balls

Forged balls of alloyed steel give a long term of service. They do not readily crack, and they are more economical than cast balls excepting where a plant is operated in conjunction with a foundry where odds and ends of iron scrap are melted and cast into grinding balls. The use of special foundry molds is not general. Some foundrymen prefer the sand to the chill mold, relying upon the grade of material and foundry skill to produce a hard and tough cast ball.

Balls which have a diameter smaller than 1-in. do not produce an effective crush, but they do consume power in the mill operation. While this point is true, it is nevertheless an impossibility to consider this fact in a plant which operates several mills on a large scale. Grading the daily ball charge is of doubtful value. The practical plan is to feed balls of one size and to allow the mill to adjust and grade its load automatically. These balls will wear down to 1-in. discs and then crack or disappear under action.

Practical Uses of Grinding Balls

Considering the use of different forms of grinding balls from a practical standpoint, it should not be expected that special shapes will increase the grinding efficiency of a mill to any great extent. An improved product can be secured, but not to any great degree. An improvement can be expected in dry rather than in wet grinding.

Ball and tube milling improvements are not confined to any one feature of the mill or to its loading, but rather to a general refinement of several features—the proper design of mill, the feed, the right grinding medium, and the liberty and freedom of the discharging product. And all of these elements must be combined with intelligent operation.

Senator Edge's Resolution to Help Trade Associations

BUILDING interests are watching with interest the course of U. S. Senator Edge's resolution, offered on April 2, to clarify the atmosphere of uncertainty that pervades trade associations in general. This resolution has been read twice and referred to the Senate commerce committee. It provides for the creation of a committee to investigate existing conditions of industry and commerce in the United States for the purpose of recommending to Congress legislation defining the rights and limitations of co-operative organizations as distinguished from illicit combinations in restraint of trade. Provision is made that a final report shall be made before December 4, 1922.

The resolution provides that three members of the investigation committee shall be appointed by the president of the Senate and three by the speaker of the House. The bill provides that all trade associations shall file with a duly appointed commission all statistics collected by such association, including credit information, figure showing stocks on hand, shipments and production, contracts, prices, etc., which data the commission may have the power to make public as it sees fit.

It further provides that a notice be sent to the commission of every meeting of such trade association, giving time, place and character of meeting, or any committee or sub-committee thereof, seven days before the meeting takes place. The commission is empowered to give a ruling to any association with respect to the legality of its plan of organization as expressed in its by-laws and any agreements or contracts between the association and its members, which constitute the working of the association.

Pacific Cement Co. Asks Freight Reparation

IN its complaint against the Southern Pacific to the California Railroad Commission, the Pacific Portland Cement Co. has asked for reparation on shipments of lime rock from Flint to Tolenas. The reparation is asked on all shipments moving in the last two years and the measure of reparation is stated to be the difference between 50 cents a ton declared to be the lawful rate, and charges of 70 and 90 cents a ton alleged to have been made.

Producing Gravel with Few Men

By Stephen Stepanian, General Manager
The Arrow Sand and Gravel Co.

Low labor costs are the outstanding feature of this plant which started operation about a month ago. Then, too, a capacity for 30,000 tons' storage is unusual, even for a large plant, and this is not one of the largest. Searchlights to aid night work will make possible a total output three times the normal, and a duplication of practically every piece of equipment is good insurance against time-consuming breakdowns

WHEN we started out 11 months ago to design the plant of the Arrow Sand and Gravel Co., we had three things in mind: To produce a high quality of material, to produce it with a minimum of labor, and to maintain sufficient quantities in storage to insure the contractor prompt service on whatever quantities of material he might need. In working out the plan, we believe, all three of these aims have been realized. Besides, we have secured a plant which is practically proof against shutdowns. This last result has been obtained by providing a large initial storage and duplicating every important part of the operating equipment, with bypasses to shunt out the broken parts of the production line. The dragline hoist and the main belt conveyor are the only principal parts of the operating plant which have not been installed in duplicate, and the large initial storage provides against hoist breakdowns.

Let us take up these features, point by point.

First, the quality is insured initially by the nature of the deposit. Material is taken from a bed of gracial deposit material, which is approximately a semi-circle in shape, covering about 82 acres of ground. The area is bounded on the south by the embankment of the Big Four railroad tracks, about a mile long, and on the west, north, and east by the right bank of the Scioto river, which makes almost a complete semi-circle about the plant. The deposit has 40 ft. in depth of clean material, about 45 per cent sand and 55 per cent fine and coarse gravel—with a top surface of 18 in. which is easily stripped by means of a clam-shell derrick. Thorough and careful screening and washing puts this material into the most desirable condition for use in concrete or macadam purposes or for railroad ballast.

A minimum of employes results from the careful designing, which provides for mechanical handling wherever it is possible. Seven men—including two for loading, and the superintendent, operate the plant when it is producing its normal output of 1000 tons of washed and screened material a day, although the entire equipment is designed for 1500 tons a day. Many other plants employ more than twice as many men to produce the same daily quantity. I doubt if any plant in the country produces the amount of

WHERE SEVEN MEN PRODUCE 1000 TONS A DAY

The Arrow Sand and Gravel Co.'s plant at Columbus, Ohio, is designed to produce 1500 tons daily, but seven men—a superintendent, one man each at the pit, the hoist, the crushing plant and the washing plant, and two men loading trucks and cars—produce a normal output of 1000 tons

This is the excavation soon after making the first cut. Wash water can't be pumped from this cut or from the river. The derrick is used for stripping

The hoist house, well protected against floods

material we do with as few men as we require. Careful designing and the selection of equipment best suited to the conditions of the deposit are responsible for this low labor force.

Storage capacity of 10,000 tons is provided by 11 storage bins—eight circular bins with three intermediate bins formed

The first cut with the dragline was made near the pump house, and the excavation will gradually swing away from the plant to the other opposite side of the plant

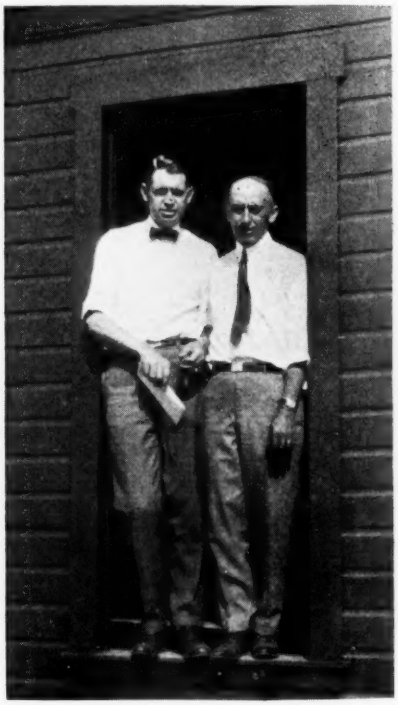
by constructing short connecting walls between the closest point of the circular bins. The illustrations show how these intermediate bins are formed. Both the circular and the intermediate bins have a capacity of approximately 1000 tons of material each. Outside storage for 20,000 tons more has been planned, as I shall explain later, assuring to the customers deliveries of any quantity of material as rapidly as desired.

These are the three outstanding features—quality of material, low labor cost, and the adequate storage. The fourth feature—continuous operation under all conditions—is secured by providing for large initial storage and by making practically all equipment in duplicate so that if anywhere along the line something breaks down we need only to shift to the working half of the equipment which can easily be overloaded one-third of its normal capacity and we can continue to get ⅔ of our normal capacity even if the break is serious. Our crushers and scalping and tailing screens are so arranged that if part of the equipment goes wrong material can be bypassed to the duplicate set of equipment, with only a slight interruption. There are two parallel secondary belt conveyors, one of which is normally used for round material and sand, and the other for crushed material, but if either one breaks down, the other may be used for either or both materials. Similarly the washing and screening plant is in duplicate. Two parallel sets of screens may be operated at the one time, or either one alone. And two scraper conveyors from the sand dewatering tank may be used together to reclaim either one or two grades of sand, or separately to reclaim a single grade.

With these precautions it is not likely that operations will be stopped because of accidents to equipment, and since one-third of our season's output has been sold in advance we probably shall not have to close down for lack of orders.

The shape of our deposit makes possible a particularly economical method of working by using a dragline and a hoist. At approximately the center of the area is located a concrete-protected hopper which forms the center of our initial storage pile. This storage is maintained at about 2000 tons, to provide material for two full days' run without any excavating whatever. It happened the other day that our hoist operator did not appear, but his absence did not affect the normal production of the plant in the least. The storage pile, naturally, decreased, but a little overtime on the next two or three afternoons put the storage back to 2000 tons.

The hoist house is north of the hopper about 75 ft., and by gradually moving the 100 ft. steel mast of the drag-



President S. Neal Hallock and the author, Stephen Stepanian, who designed and is general manager of the plant

The main belt conveyor going to the crushing plant

line around the hopper it is possible to excavate for a distance of from 600 to 700 ft. on all sides of the hopper, making a complete circle except for the strips of ground perhaps 60 ft. wide needed to support the hoist house, the crushing plant, and the primary and secondary belt conveyors. By gradually shifting the mast about the hopper, material from all parts of the deposit can be excavated and dumped on the initial storage without changing any of the rest of the plant equipment. The hoist is set on concrete piles 12 ft. above grade so that high water which occasionally occurs will not affect it.

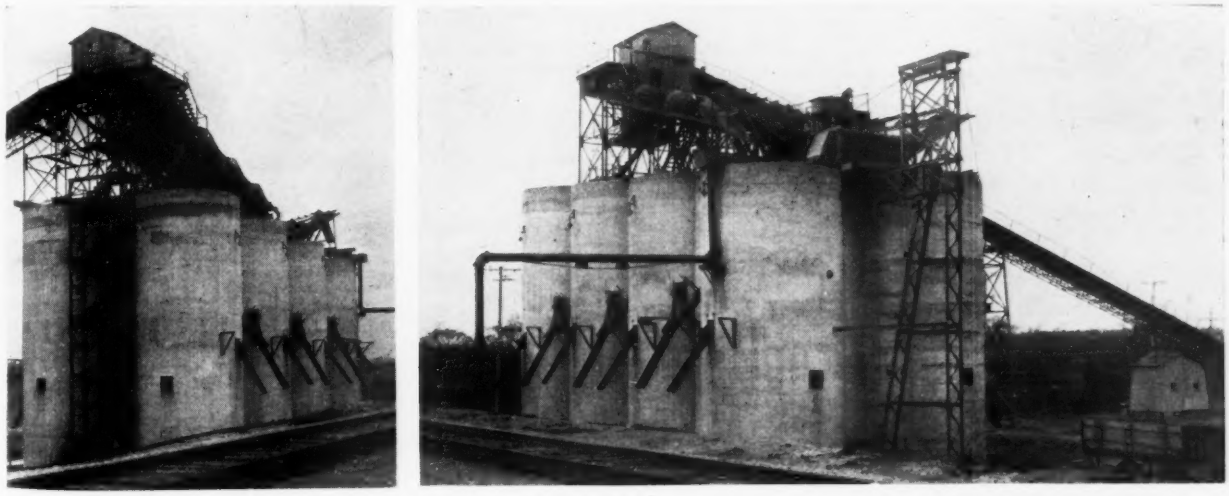
The hoist itself is a 200-hp. Thomas hoist, the largest, I believe, ever made for sand and gravel work. A Sauerman 2-cu. yd. dragline does the excavating and keeps the initial storage pile supplied.

From the initial storage the material feeds by a reciprocating feeder through the hopper to the lower end of the primary belt conveyor. This conveyor is a Jeffrey, as are all the conveyors, elevators, and the sand dewatering tanks. This belt is a Goodyear, 30 in. wide and 240-ft. centers, and runs at an angle of 14 deg. and a speed of 200 ft. per minute. One man at the feeder keeps that running smoothly, prevents boulders from interrupting the uniform flow, and feeds more or less material than the feeder supplies in case such variations are necessary.

At the top of the crusher house the belt discharges directly into the scalper screen. All material 2 in. and less is removed and chuted direct to one of the secondary belt conveyors I have mentioned. Everything over 2 in. goes through a No. 7½ Superior gyratory crusher, the crushed material passes through the tailing screen, and the oversize goes through a No. 5 crusher, and all material from both crushers is chuted to the second of the secondary belt conveyors.

The two parallel belt conveyors, each 20 in. wide, 295-ft. centers, operate at an angle of 18 deg. and have a speed of 300-ft. per min. They are about 3 ft. apart and run to the washing plant over the bins. The top of the washing plant is 95 ft. above grade. Water for washing is supplied by two Weinman pumps, either of which may be used alone. This duplication of pumping facilities is one more of the precautions we have taken against shutdowns. Water can be taken either from our own excavation pool or from the river. Two parallel sets of Dull four-unit conical washing screens provide for making simultaneously five sizes each of round and of crushed material, 2-in., 1¼-in., ¾-in. and ⅜-in., and sand. Either set of screens may, of course, operate alone for either grade of material, or the two grades may be combined on one or both sets of screens. The sand from the screens is flushed through the flumes to the sand dewatering tank, which is also in two units and may be regulated to produce concrete sand and mason's sand simultaneously or either one alone.

The overflow from the dewatering tank is at the present time run into a low place on the south side of the Big Four tracks, and will eventually fill in that low place with fine settlings to the advantage of the railroad company, while at the same time providing it with a convenient place for disposing of this overflow. We cannot dump the overflow back into the river, and long before this low place is filled we shall have plenty of excavated territory into which to put it. The washed and



Here are the west—at the left—and the east—at the right—ends of the storage bins, with the south side and its lower chutes for loading a single size, and the upper chutes from main and intermediate bins for loading any 3-size mixture desired. The wide, safe stairway is shown at the west end, and at the east end is the steel tower which will support the elevator which carries material to the open storage east of the bins

On this incline two belts carry round and crushed material, respectively, from crushing plant to washing plant. The first supporting tower has been covered to make a pump house, and the second will be covered to make a tool house

At the left is one set of washing screens, and at the right, not shown, is a duplicate set. The two men are standing over the sluiceways and sand dewatering tanks, and one end of the railroad siding is shown beyond

graded sand and gravel discharges into the 11 bins I have referred to. These bins are of monolithic concrete construction made by Clemens and Martins by using slip forms. The eight round bins are 20 ft. in inside diameter, 54 ft. high, and have walls 7 in. thick provided with circular reinforcing.

A feature I have never seen elsewhere in gravel storage is the three-way spot arrangement made possible by the construction of the intermediate bins. An illustration shows how a spout from the intermediate bin and one from each of the adjacent circular bins will discharge into a truck or car simultaneously. By regulating the flow from each bin any three-size mixture in any desired proportions can be obtained, and the material will be really mixed as it is loaded, and not a layer of one size followed by a layer of another size.

The tunnel underneath the storage bins shown during construction

We now have side-track facilities to hold 40 cars, and once these cars are set off all can be operated by gravity until they are loaded and ready to be shipped. Tracks now extend only along the south side of the bins, but they will be extended along the north side also. To reclaim material from the bins which is below the loading spouts a tunnel underneath the bins will have a belt conveyor leading to the east end of the bins to an elevation supported by a steel tower where the material will be raised either for loading or for dumping on the open storage which will be provided. This open storage will extend 300 ft. to the east of and in line with the bins, and below the storage will be installed a concrete-covered belt conveyor so arranged that hoppers will deliver material to the belt from the various open storage piles and the belt will carry the material back to the same elevator from which it can be loaded or returned to storage in the concrete bins. This open storage will have a capacity of 20,000 tons, making a total storage capacity

The initial storage

Tunnel with storage bins completed

of 30,000 tons of material at the plant.

This is the plant which is producing 1000 tons of high quality material a day with seven men—one at the hoist, one at the hopper in the pit, one at the crusher house, one at the top of the washing plant, two loading trucks and cars, and a superintendent. The other day we produced our normal capacity with only three men working—one at the hopper, one at the crusher, and one at the washer. This small labor force, made possible by careful designing, is to me one of the most important features of the plant. The small amount of labor required is not the only reason why we are proud of the plant, however. Throughout we have spared no expense to put in the best materials and to provide every safety feature. The result is a plant which we expect to operate much longer than the average, and at considerably lower cost for repairs and upkeep. The plant is steel and concrete throughout except for the crushing plant, which is built of 12x 12-in. timbers with corrugated ingot-iron covering.

The equipment we have selected has been of the best, and we have chosen carefully that which is best suited to our conditions. Besides, we have left nothing undone in providing for the safety and comfort of employes. Wide stairways, stout railings, brilliant electric lighting and searchlights for night operation, and all the necessary safety devices have been installed. Most important of the safety precautions are the buttons provided for stopping the operation of all preceding processes. At the hoist house a button will stop instantly the operation of the hoist; three buttons are located at convenient points in the crushing plant any of which will stop the crushers, screens, and main belt conveyors; at the washing plant two buttons have been arranged to stop not only the screens, washers, and the secondary belt conveyors, but the main belt conveyor and everything at the crushing plant as well. These safety devices not only protect workmen, but what is important from the operation point of view, they prevent material from piling up and clogging the works at any point.

Powerful 200-watt lights in the crusher house and pit and searchlights covering the entire area of the deposit make it possible to work day and night if necessary, which would practically triple our normal capacity, making it possible for us to produce 3,000 tons a day if necessary.

Power to operate the plant is purchased from the local power and light company, and is transformed by our own transformer from 15,000 volts to 400 volts. All our equipment is operated by individual slip-ring motors, and our switches are oil switches with no fuses.

We have made use of the two towers supporting the secondary belt conveyors by covering them and making one into a pump house and the other into a tool house.

Our three belts we wash continuously by sprays under the head pulleys. Sand and gravel are always more or less sticky when wet, and as soon as the belt discharges its load the small amounts which remain adhering to the belt are taken off by this spray. You can walk under any of the belts without fear of any of the sticky material falling on you, for there is none of the material left on the belt to fall.

The stripping has been used to grade the siding and the highway out of the plant to the main line and the main highway, and from now on we plan to use the stripping for building a high levee around the property on the river side to guard against flooding the property in times of high water.

In a short time we shall have put in concrete flooring on the truck loading area, and truck scales will be provided to weigh all material leaving the plant.

This describes the main features of the plant as it is operating today, with some of the additions which will shortly be put in to complete what is easily one of the most modern plants in equipment and methods in the country today. It is not the largest plant in operation, but I do not hesitate in saying that it is the most efficient one which I know of, and perhaps the most efficient one in existence. We, at any rate, are very proud of it.

National Agstone Association's "Punch and Pep" Meeting

FULL of enthusiasm, punch and frankness, members of the National Agstone Association gathered at Columbus, Ohio, on April 12. Under the able direction of Secretary Sandles, the meeting was remarkable for the concentrated help which filled it from beginning to end. A number of visitors were present, some of whom spoke briefly but wisely.

The activities of the day started with the forenoon meeting of the executive committee, with Chairman J. C. King presiding, at which a number of business matters were settled. The Grove City Limestone Co., of Grove City, Pa., was admitted to membership. Two of the members reported their co-operation with the railways in furnishing free agstone and free transportation for limestone demonstrations in a dozen counties.

At the luncheon and afternoon session 40 men were present who represented the trade, farm, and city press, the State University Agricultural College, State Experiment Station, State Department of Agriculture, State Grange, State Farm Bureau, farmers and manufacturers of Agstone and accessories.

The guest of honor was Dr. Charles E. Thorne, of the Ohio Experiment Station, who a quarter of a century ago discovered the great value of Agstone to the farm and the farmer. Dr. Thorne showed that the only reason why lime is better than limestone for agricultural purposes —and he stated that present knowledge indicated that a ton of lime is, in the beginning, worth two tons of limestone—is its fineness, since lime has to go back to the carbonate form before it has a beneficial effect on the ground. His advice was to sell nothing that will not pass a 10-mesh and very little that will not pass the 100-mesh.

State Director of Agriculture L. J. Taber, Prof. Finnan E. Bear of the Ohio State University, F. L. Allen, state director of Farm Institutes; O. E. Gradfute, president of the Ohio Farm Bureau Federation; Harry A. Caton, master of the Ohio State Grange; G. R. Lewis, state grange lecturer, and Prof. Robert M. Salter of Ohio State University were among the visitors who addressed the meeting. F. R. Kanengeiser, of the Bessemer Limestone and Cement Co., and W. H. Hoagland, of the Marble Cliff Quarries Co., and a number of other members also made addresses.

The registration list included:

Edgar M. Lamkin, president National Agricultural Limestone Association and representing the Kelley Island Lime and Transport Co., Cleveland; F. R. Kanengeiser and Clyde Calvin, Bessemer Limestone and Cement Co., Youngstown; J. C. King, Carbon Limestone Co., Youngstown; R. J. Fuller, Columbia Products Co., Cleveland; W. M. Brown, France Stone Co., Toledo; Harry Brandon, Ohio Marble Co., Piqua; Frank Colgan, Colgan Limestone Products Co., Columbus; Fred J. Streiter, Michigan Limestone Co., Buffalo, N. Y.; Harry J. Filer, Jr., Grove City Limestone Co., Grove City, Pa.; M. J. Blair, Browning Co., Cleveland; Fred S. Curtis, W. S. Tyler Co., Cleveland; W. H. Story, American Seeding Machine Co., Springfield; A. L. McCallum, American Seeding Machine Co., Springfield; W. H. Hoagland and W. H. Margraf, Marble Cliff Quarries Co., Columbus; F. Renzenberger, Marion Steam Shovel Co., Marion; P. J. Clemens, Jaite Co., Jaite, Ohio; C. S. Darling, Editor "Rock Products," Chicago; Charles E. Thorne, Ohio Experiment Station, Wooster; J. A. Meckstroth, "Ohio State Journal," Columbus; B. W. Sebring, Chief Bureau of Feeds and Fertilizers, Columbus; Robert M. Salter, Department of Soils, Ohio State University, Columbus; E. H. Kipp, George & Sherrard Paper Co., Wellsburg, W. Va.; Firman E. Bear, Ohio State University, Columbus; O. E. Bradfute, president Ohio Farm Bureau Federation, Columbus; L. J. Taber, Director of Agriculture, Columbus; G. R. Lewis, lecturer Ohio State Grange, Findlay; Harry A. Caton, master Ohio State Grange, Fresno; N. E. Shaw, "National Stockman and Farmer," Columbus; Harry R. O'Brien, "County Gentleman," Columbus; O. M. Johnson and W. W. Brownfield, department of County Agents, Ohio State University; Frank C. Dean, "Ohio Farmer," Columbus; F. L. Allen, director Farm Institutes, Columbus; A. P. Sandles, secretary, Columbus; Claude L. Clark, assistant secretary, Columbus; Russell Rarey, Marble Cliff Quarries Co., Columbus; P. C. Hodges, Marble Cliff Quarries Co., Columbus.

The Removal of Clay from Sand and Rock

By Edmund Shaw, El Paso, Texas

In this sixth installment Mr. Shaw shows that dilution is the most notable of the conditions affecting the settling rate of clay. He also discusses the effect secured in washing coarse and fine sands

THE whole process of washing sand free from clay depends, as has been shown in past issues of ROCK PRODUCTS, on the difference of settling rates. In the fourth and fifth articles (see ROCK PRODUCTS, March 25 and April 8, 1922), the theory of washing was discussed. To make this theory hold good, it was assumed that clay had no settling rate.

The truth of this last statement may be proved by anyone who cares to make a small experiment. A mixture of sand and clay may be stirred in a small vessel holding a measured quantity of water. As soon as the sand settles, the water is poured off and the clay in it is allowed to settle. The water that is poured off should be measured and the difference called residual water. The sand which remains with the clay is then carefully washed out by several washes, until the water in the last wash is clear. All of these washes should be saved and the clay in them allowed to settle. The clear water is then carefully siphoned off, so as not to lose any of the clay, and the clay in each sample dried and weighed. If the work has been carefully done, the weights of the two clay samples will be found to closely correspond to the weights of overflow and residual water.

The Constitution of Clay

In a plant which produces the sands ordinarily used in building operations and the like, the operator does not need to worry much over the settling of clay with his product, as the experiment just described will prove. He has only to run his plant in accordance with the principles of washing to secure a clean product, or at least a product clean enough for his purpose. But the case is different with the operator who is trying to wash the very fine sand of phosphate rock or some special silica sands. For that reason it will pay to consider the constitution of clays, if only in a superficial way, and to learn something of the causes that affect their settling.

Clays can be analyzed easily enough by chemists, but their analysis do not tell us much about the physical properties, and these are what affect the behavior of the clay in washing. In the first place, it is rather hard to say where sand leaves off and clay begins. The writer's chief, Charles Allen, of the Allen Cone Co., has done considerable work on the separation of very fine material, and the writer is familiar with the results. These results show that distinct grains are to be found in very fine material, and that the clayey material, made by crushing quartz, for example, contains a large proportion of such particles. It would almost seem that clay and sand shaded off into one another, although there is no direct evidence to prove this.

Settling Rate of Clay

It cannot be said of sand that it has a definite settling rate, the rate varying with the size of the grain, and this rate is pretty constant under all conditions. That is, if a grain of sand settles at the rate of an inch a second, for the first second, we will find that it will settle an inch in the next second. But we cannot say anything so definite of clay.

The most notable of the conditions that affect the settling rate of clay is dilution. The more dilute the mixture of clay and water, the faster the clay settles. If you will mix a little clay with several times its weight of water and then watch the clay as it settles, you will get a good idea of what the effect of dilution is. At first, the clay will come down quite rapidly, and then it begins to slow up. Let us say that it settles an inch in the first minute. In the next minute you may find that it settles half an inch, in the next a quarter, and so on. The clay is thickening, and the thicker the mixture becomes—that is, the less the dilution—the slower the settling rate will be. Soon it becomes very slow, and finally it reaches a point where it will not settle perceptibly if you let it stand a week. This is said to be the critical point of settling for that particular clay.

This critical point varies greatly with different clays. The writer has seen clays that would not settle below a point where the pulp was two-thirds water—a coagulating agent was used to secure even that settling

Effect of Temperature

The only other condition likely to be met in sand washing which will affect the settling rate of clay is that of temperature. Briefly stated, it may be given as a rule that the higher the temperature, the better the clay settles. Of course this does not apply when the boiling point is reached, for then the clay will not settle at all. But it is generally true for temperatures below the boiling point.

It might therefore seem that it would be harder to wash fine sand free from clay in warm weather than in cold, but the settlement of fine sand is also increased, and it appears that the fine sand settles more readily through the mixture of clay and water; it penetrates it more easily. These things more than balance the greater settling rate of the clay. The writer was told by the manager of one of the large companies operating in the Tennessee phosphate field of an experience that illustrates this point.

Originally the material was pumped to the washing plant by a steam pump of the pulsometer type, in which the steam comes in contact with the water. The plant water was at all times perceptibly warm, even in the coldest weather. The washing was very good, and the recovery of fine sand was good, even though the settling area used was small. When this method of bringing the material to the plant was changed, so that warm water was no longer used, it was found that a greater settling area had to be provided and that it was difficult to get as clean washing of the fine sand. In other words, the total net effect of a high temperature was greater with the fine sand than with the clay.

However, there can be no doubt but that clay settles more rapidly in hot water. In some plants where a rapid settlement of the clay is desired it is the practice to use the exhaust steam from the power plant to heat the water for just the improvement in settling rate.

Coagulation the Preliminary Step

Clay settles in water for the same reason that sand does—because it is heavier than water—but it cannot be made to settle in

a firm, compact mass, like a mass of sand grains. Just why this is so does not seem to be thoroughly understood. What is called the electrostatic theory is one of the explanations that have been offered. According to this theory, each particle of clay carries a charge of electricity on itc surface. The effect of charges of like polarity is to cause the bodies that carry them to repel one another, just as two magnets of like polarity repel one another. It is supposed that when the critical point of settling is reached the effect of gravity is balanced by the repulsive force of these charges of electricity; hence the settling cannot be carried any farther.

It is possible that the electrostatic theory has now been discarded, for the workers in colloidal chemistry and physiochemistry have been making wonderful advances in the study of such phenomena. It is impossible, however, for one who is not directly interested to keep in touch with the latest developments.

Coagulation is one thing that helped us to believe in the electrostatic theory. While clays do not settle in firm, compact masses, they do form flocculent (woolly) masses even while they are still in suspension. This is called coagulation.

There are a number of chemical agents which hasten coagulation, and it is true that most of these agents are electrolytes; that is, liquids that conduct electricity readily. It is thought that the effect of these coagulating agents is to allow the charges of electricity to be conducted away. After the electricity is gone, or lessened in amount, coagulation goes on rapidly and settling takes place very quickly. Perhaps the best known of these coagulation agents is alum, but lime is also used on account of its lower cost.

A practical application of a coagulating agent is found in the use of lime or alum in the sedimenting basins, where the water supplies of towns and cities are freed from mud and silt. Another interesting example is found in the growth of deltas at the mouths of rivers that flow into the sea, for common salt is a coagulating agent as well as the other substances mentioned.

Our own Mississippi river gives us a good illustration. It carries a great deal of mud and silt which it deposits as soon as the Gulf of Mexico is reached. Of course, there is another reason for this dropping of the silt. The current is slowed down greatly as it spreads out after leaving the mouth of the river, and therefore it has not the carrying power. But those who have studied the matter say that the silt would not be dropped nearly so promptly if it were not for the effect of the salt in the sea water.

If fine sand is to be washed free from clay—a difficult thing to do under the best conditions—it would seem better to avoid the use of water which has lime in solution, or sea water. Some waters from swampy ground, which carry organic substances that are coagulating agents, should also be avoided.

Fine Sand Helps Clay to Settle

Whether fine sand may be considered a coagulating agent or not, there is no doubt that it helps clay to settle, for the effect is quite marked. It has been studied considerably in connection with a certain metallurgical operation in which clay and sand are settled together. It is possible that the grains of fine sand form a nucleus around which the particles of clay gather, forming a clot and starting coagulation in that way. The writer's belief, however, is that the effect is similar to that seen in the settling of coarse and fine sands together. It has been noted that, when fine and coarse grains of sand are settled together, the fine grains, or some of them, will fall as fast as the coarse grains. This is explained by saying that the coarse falling grain forms a wake in which the fine grain is caught and pulled down with it, just as the suction of a sinking ship has often caught and pulled down the small boats aunched from her side. Even though the grains of sand are very small, it must be that they have a certain effect in falling through the water, and a very small effect indeed would be enough to exert an influence on so minute a thing as a particle of clay.

Amount of Clay Settling with Fine Sand

The amount of clay that will be brought down in this way by fine sand is not inconsiderably. The writer in his work in the Tennessee phosphate field had occasion to make many determinations of the clay brought down in this way, and found that it appeared to increase with the fineness of the sand. The data in his notes are not sufficient to plot very accurately, so a curve is not given, but at the same time the data from a sample taken from the outflow of a plant may be informative. This sample contained in round numbers 9 per cent of solids, of which one-third was very fine sand and two-thirds clay. The heaviest of the sand was settled out, and this sand carried almost as much clay in proportion, the exact percentage being 27 per cent. This is fairly typical of the difficulties encountered in trying to save very fine sand when there is much clay present.

Operators of silica sand plants have tcld the writer of meeting a similar difficulty in trying to save the fine sand that escapes with the overflow of the plant. But in this case there was the further difficulty that the clay seemed to cling more firmly to the fine grains than to the coarse; this required a more thorough scrubbing of the grains to cleanse them.

Too Much Area Means More Clay

In an earlier series of articles the writer discussed the relation of the settling area to the size of the grain it was desired to settle (see "Sand Settling and Sand Settling Devices," Nos. 1 and 2, Rock Products, June 4 and 18, 1921). In that discussion the freeing of the grain from clay was not mentioned as it did not enter into the subject. But we can see from what has just been said that the size of the grain and the cleanliness to which it may be washed have an intimate relation, and that we cannot plan for one without planning for the other.

Fortunately this is on the side of economy, for settling area is one of the most expensive things about a plant. This is so true that most plants are designed with too little rather than too much settling area. It is only the occasional plant in which the settling is done in a storage bin or tank, in which we find that the settling area is greater than it should be.

Recently the writer came across an instance in the course of his work. The settling area in this case was provided by a barge at the side of a sand dredge. Ordinarily this worked well, as the water from the river was clear and there was very little clay that could be settled with the sand. But at certain stages of the river there was considerable clay in the water, and a dirty sand was produced. This condition was remedied by the installation of clay-separating devices of the right area to settle the grains it was desirable to save and to throw out the grains that were finer, and with them the clay and silt. After the installation was made there was no further trouble from dirty sand.

A Settler Can Be Too Deep

Too deep a settler also means that more clay settles with the sand, even though the area is theoretically correct. It is easy to see why this is so if the reader will recall what has just been said about the effect of the settling of fine grains on the settling of clay. If the settler is very deep there will be a great many of the fine grains which are pulling down clay and as the coarser grains fall these will pull down the fine sand and the clay which accompanies it. To be sure, this effect is partially balanced by the slow, upward rise of the water caused by the filling of the tank, but experience has proved that even where the filling is quite rapid, a better separation of the sand and clay is made in a settling device of proper design.

The safest and surest way to design a settler which is to be used for the separation of clay from sand is to make it of such size and depth that the clay and the fine sand not wanted are thrown out as quickly as possible by the overflow to where there is no danger of their settling with the sand.

(To be continued)

A Modern Japanese Cement Plant

No. 1—Latest plant erected by the Asano Cement Company, at Kawasaki, shows great progress made by the Japanese in modern cement manufacture

LIKE ALL OTHER THINGS attempted by Japanese enterprise, the progress of cement manufacture in Japan has been a swift one since its origin in about 1871. The industry was first fostered by the Japanese Government and the first plant built at Tokyo had a capacity of only 100 bbl. per day. In 1883 the plant was purchased by Soichiro Asano, who at once started to place the industry upon a basis that caused it to thrive and to grow into proportions which today compare favorably with the most modern cement-making plants anywhere else in the world, besides making it the acme of Japan's extensive industrial development.

In 1914 the Asano Cement Co. commenced the erection of the first unit of what is now known as the Kawasaki plant, on reclaimed land on the bay between Tokyo and Yokohama near the village of Kawasaki, in the prefecture of Kanagawa. When this plant was completed, a second unit was at once projected and Paul C. Van Zandt, at that time sales engineer for the Allis Chalmers Mfg. Co. of Milwaukee, went to Japan to negotiate for the sale of the machinery for that company through their agents, the American Trading Co. of New York and Tokyo.

Mr. Van Zandt was placed in charge of the design and construction of the second Kawasaki unit as consulting engineer for the Asano Cement Company. Later Mr. Van Zandt became chief engineer of the

Paul C. Van Zandt, chief engineer

Asano Cement Company, in general charge of the engineering operation and construction of all the plants of that company, which position he now holds.

The detailed and working drawings were all made under the supervision of John A. Roberts, cement plant designer of Allis Chalmers Mfg. Co., who followed Mr. Van Zandt to Japan and organized a competent drafting force from the engineering staffs of the cement company and the Tokyo office of the American Trading Co. Work on the new plant commenced in the fall of 1917 and completed the latter part of 1919. Every modern thought with reference to plans and equipment was embraced in the latest installation of the Asano Cement Co. The buildings and binwork are entirely of reinforced concrete and the machinery units are of the latest and most up-to-date manufacture. No American cement plant surpasses it in the "concrete-for-permanence" type of construction.

The new No. 2 plant at Kawasaki began operations in October, 1920. The No. 1 and 2 plants combined have a total capacity of 5,000 bbl. of cement per day.

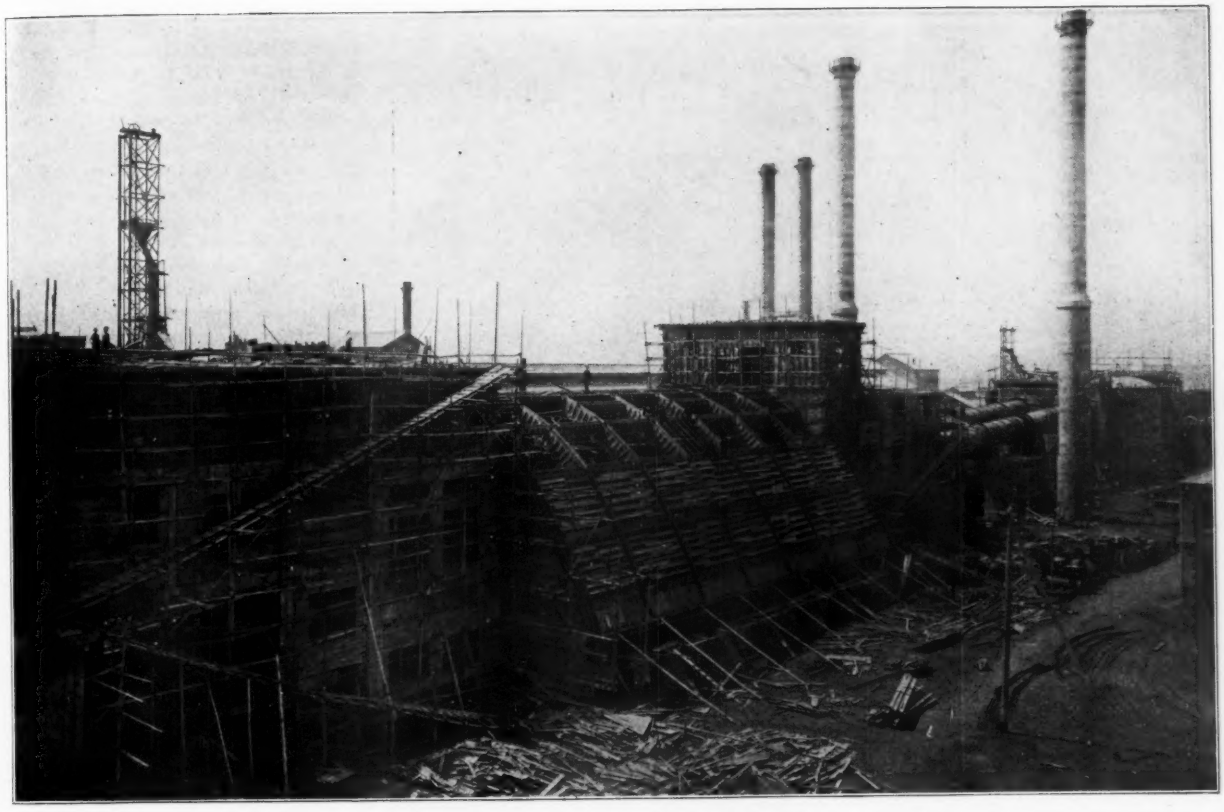
Raw Materials

The limestone quarries which supply the main ingredient in the manufacture of cement are located about 25 miles west of Tokyo and about the same distance from the plant. The rock on being received at the plant is unloaded in a rock storage, which is covered and has a capacity of about 30,000 tons. The limestone obtained from these quarries is very dense, containing only surface moisture and as a result of this drying of the rock is not necessary.

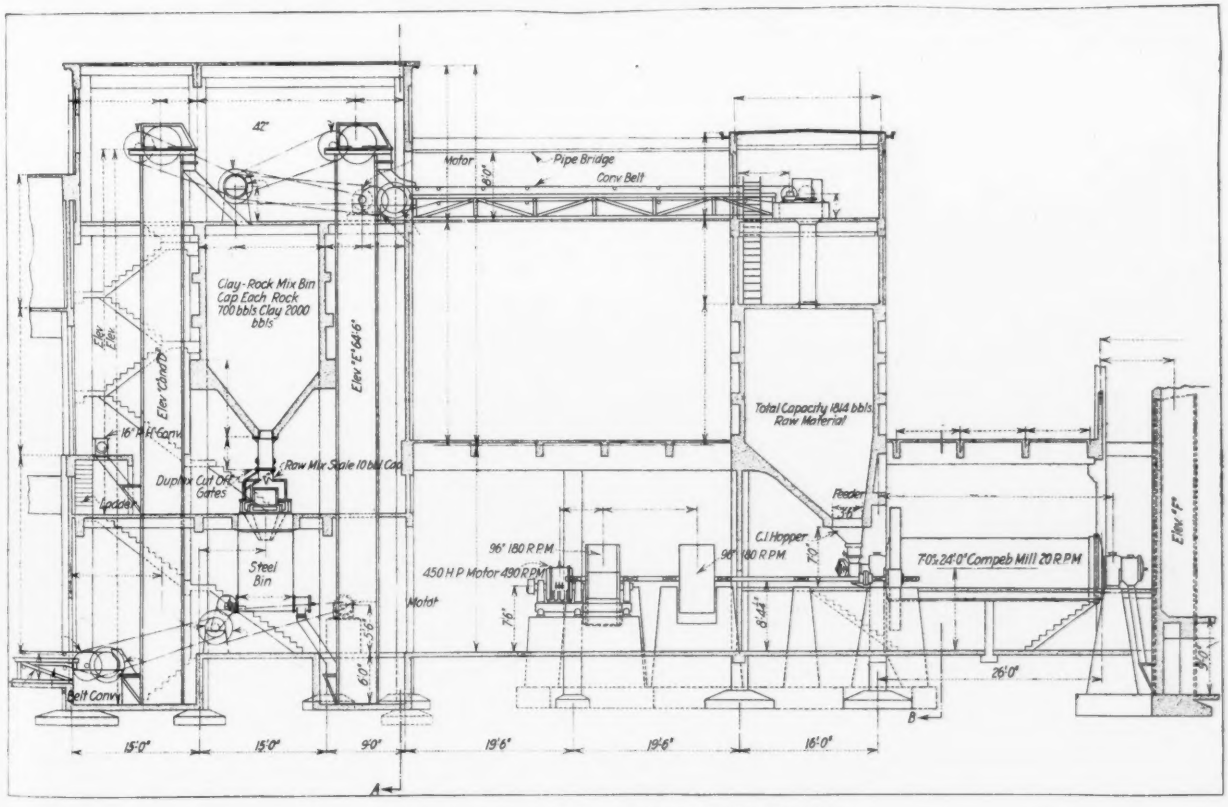
The clay which is obtained from a quarry near Yokohama supplies both silica and alumina. This is also brought

Coolie woman labor was employed prior to the erection of the modern plant

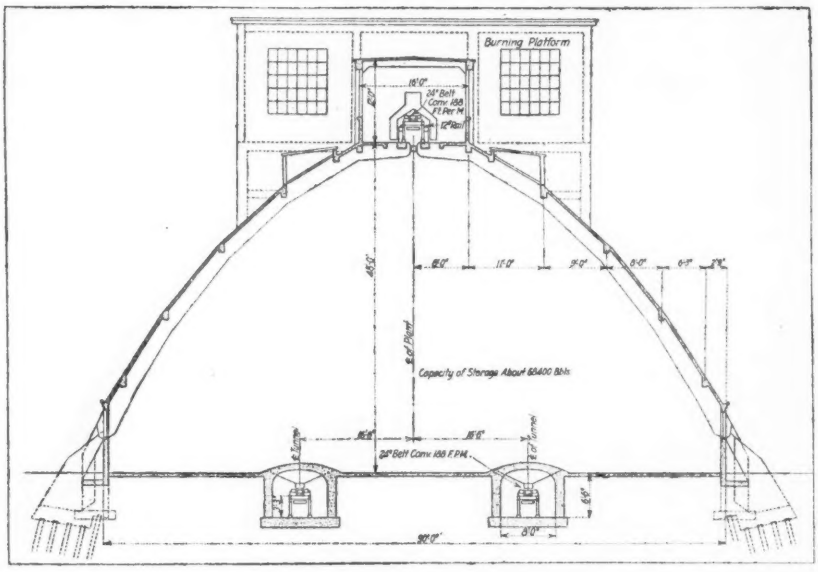
John A. Roberts, cement plant designer



This general view shows the Asano plant while under construction



A cross-section of the clinker grinding building



Cross section of the clinker storage

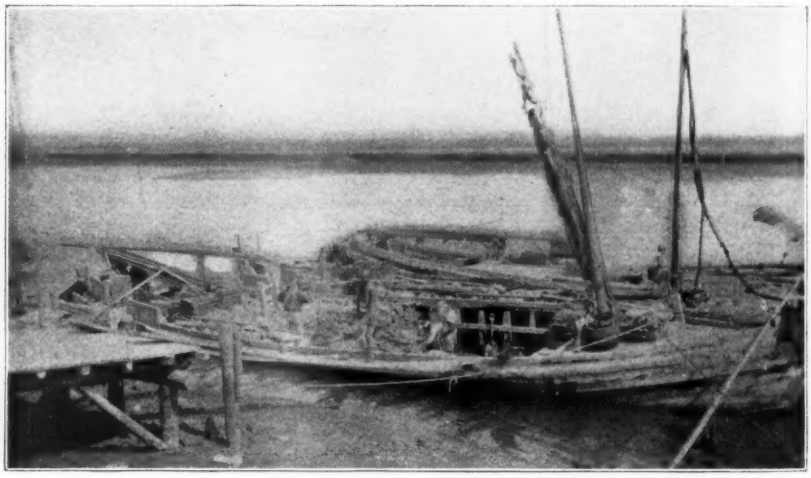
in on cars and deposited in a covered storage having a capacity of 20,000 tons. From the storage the material is run through a set of slugger rolls which reduce the material to a suitable size for passage through the dryer. No. 1 plant originally had two 6x60-ft. indirect heat dryers for drying the clay, but these were found not to be sufficient, due to the high percentage of moisture. (The clay contains from 20 to 30 per cent moisture.) The clay after leaving the rolls is reclaimed by a bucket elevator which deposits the material in a feed bin at the head end of the dryers. In the dryer building for the No. 2 plant the material is then fed in to two 8x60-ft. single-shell, direct-fired dryers by 18-in. reciprocating feeders. The extra large dryer here affords greater capacity. The two drying buildings are so arranged that the material from either one can be sent to either the No. 1 or the No. 2 plant.

Removal of Dust and Gases

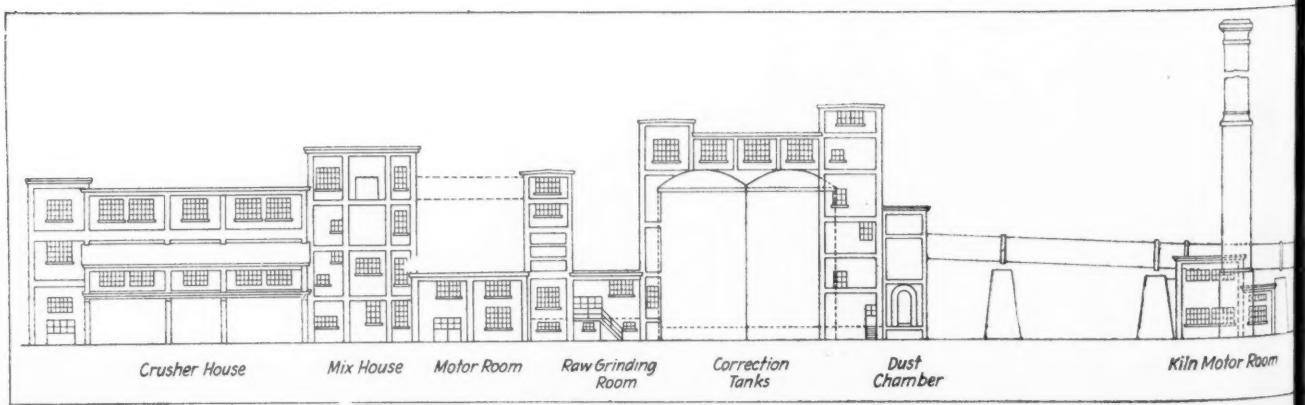
An interesting feature in the operation of the dryers is the collection of dust and gases. In the drying of the clay considerable fine dust is created, which had a tendency to settle on a Buddhist temple that is located in close proximity to the cement plant. The high authorities of the temple raised considerable fuss over this. To obviate this nuisance and keep the temple clean it was necessary to install a system which would remove the dust created in the operation of the dryers.

At the head end of the dryers is a concrete dust chamber which connects to both of the dryers. The gases are exhausted from this chamber by means of a fan and discharged into a 12-ft. concrete cyclone collector. From the cyclone the gases pass into a Cottrell electric dust precipitator 10 ft. wide and 30 ft. long which removes all remaining dust.

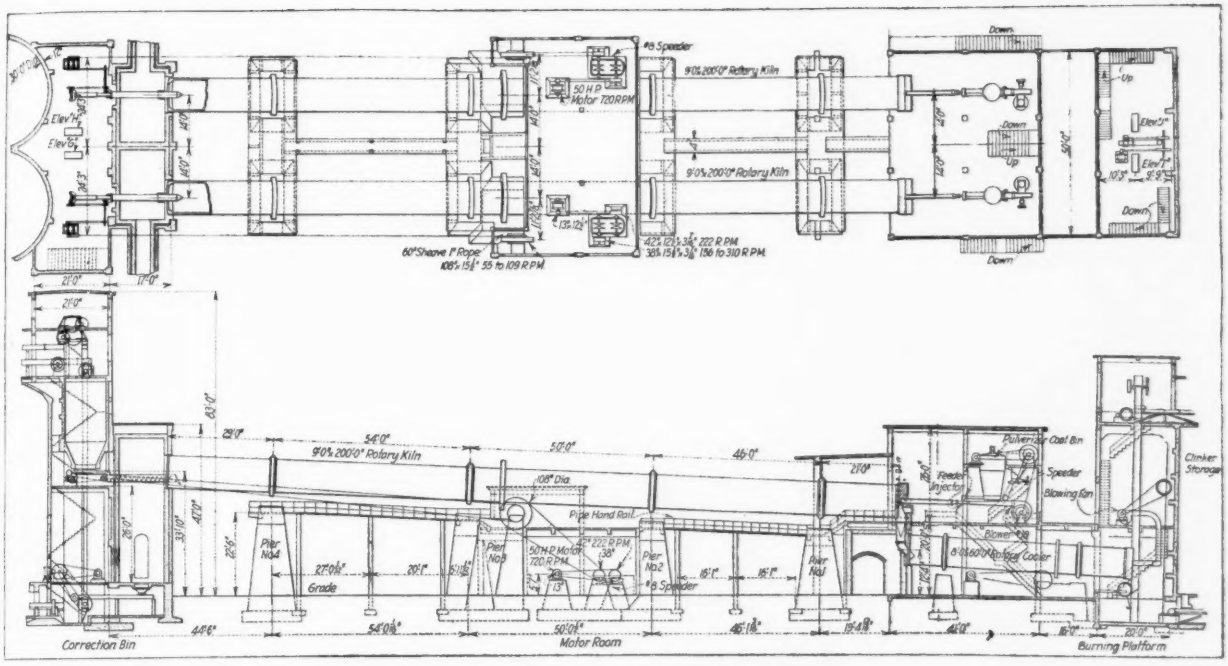
The clay on leaving the dryers is conveyed either to a storage bin or the material is elevated to an overhead screw conveyor on a bridge spanning the rail-



This is the type of boat used to convey the gypsum



General elevation of all buildings in Pla



Plan and elevation of kilns and burning platform

road tracks, where it is conveyed to the mix bin in Plant No. 2. (The different storages are shown in an accompanying drawing showing a general layout of the plant.)

Crushing Plant

There are four No. 5 Gates gyratory crushers. The rock is dumped into any one of these gyratories from the cars and is reduced to about 1½-in. size. The top of the crushers is about on a level with the ground line. The material from the crushers is reclaimed by two No. 5 bucket elevators of 64-ft. centers, which discharge the material into two 40-in.x16-ft. screens.

The material under 1-in. goes through the screens and onto a 24-in. belt conveyor located just a little above the grade line. The material over 1-in. drops from the screens into bin located over a set of 54x24-in. Anaconda rolls, which reduce the over-size for conveying to the raw mill. The 24-in. belt conveyor under the rolls delivers the material to an elevator which deposits it in a raw-mix bin having a capacity of 770 bbl. of rock and 2,000 bbl. of clay.

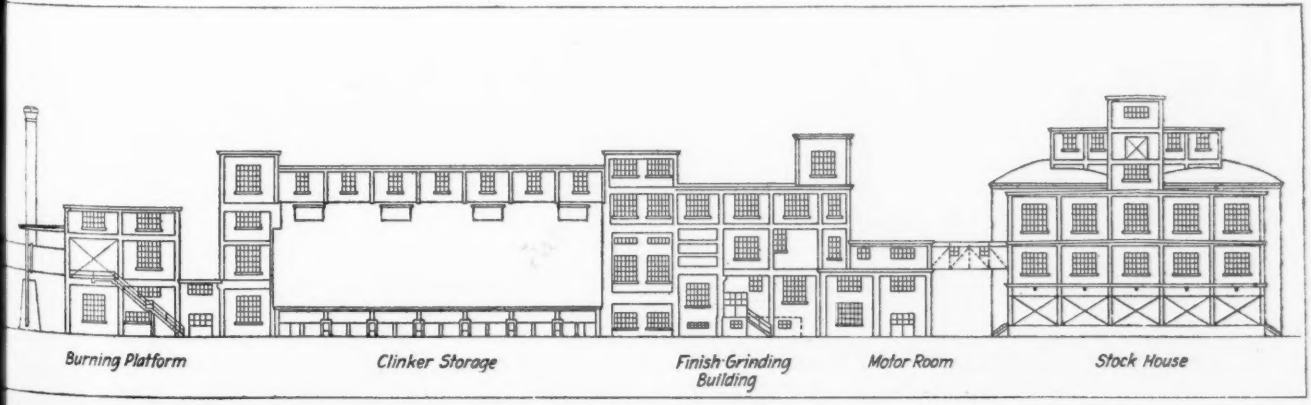
Raw Grinding

The clay is brought over direct from Plant No. 1 in a 16-in. screw conveyor which deposits the material into an elevator at a point 24 ft. above the belt conveyor. It is then elevated and deposited in the raw-mix bin.

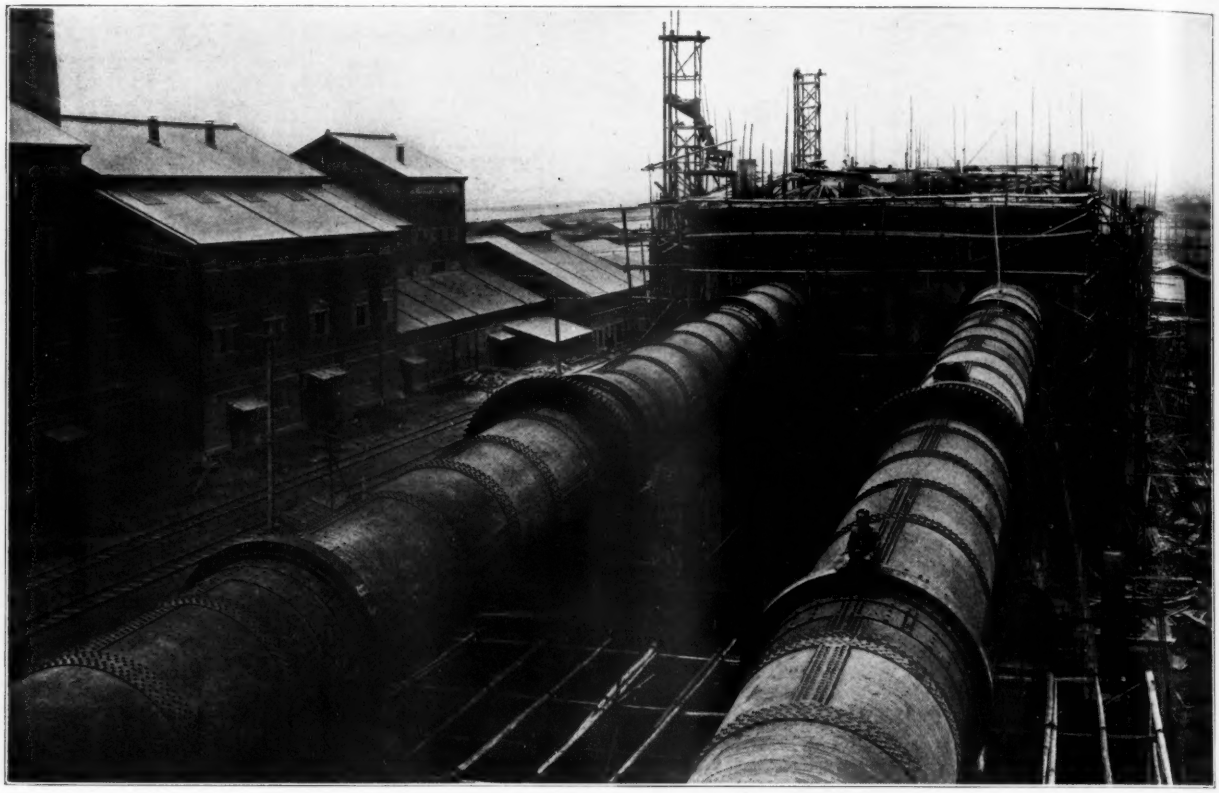
Underneath the raw-mix bin are two scales of five and three tons capacity, respectively, which weigh out the correct proportions of the materials and discharge them into a steel hopper directly underneath. From this hopper the mixed material is fed by a reciprocating feeder into an elevator which elevates it to the feed tanks of the raw grinding machines. These feed tanks have a combined capacity of 1814 bbl. and serve two Allis-Chalmers No. 724 compeb mills. The material is fed from these bins into the compeb mills through an improved type Allis-Chalmers style "B" feeder. The compeb mills are belt-driven from 450-h. p. motors and run at 20 r. p. m.

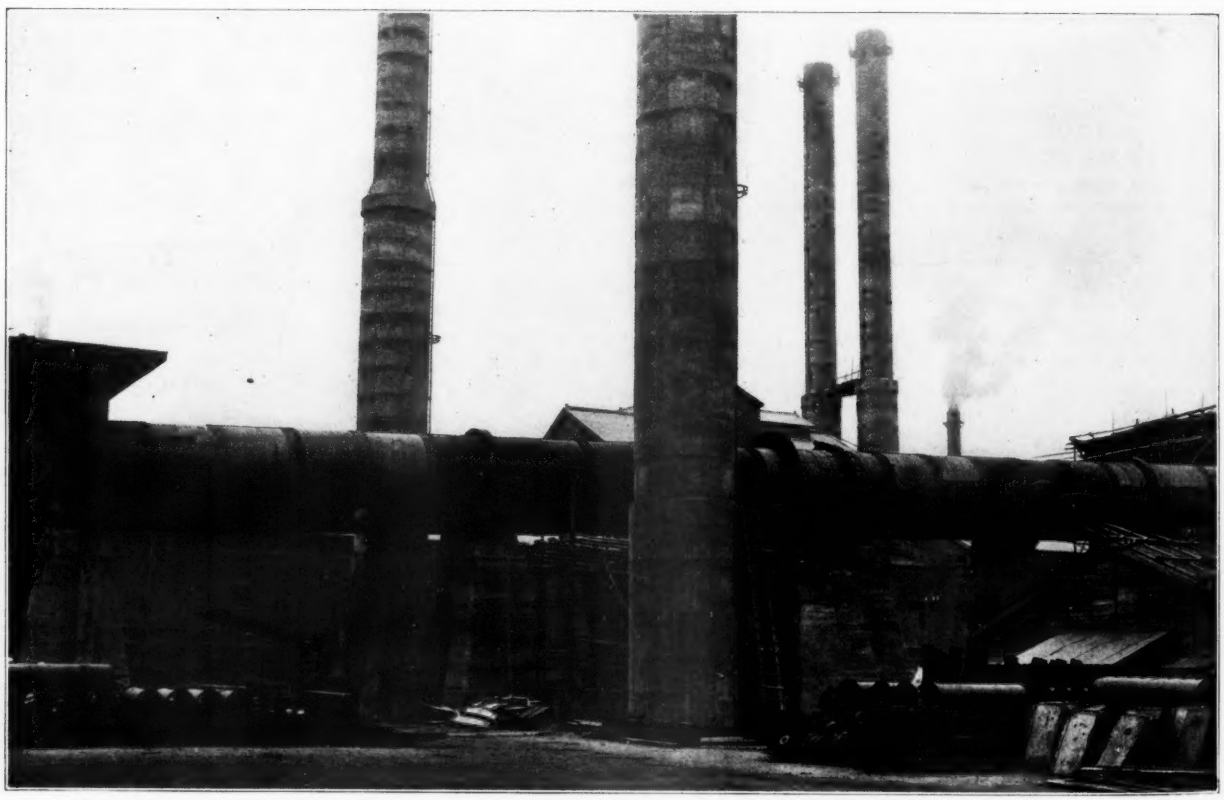
Correction Bins

The finely ground raw material on be-

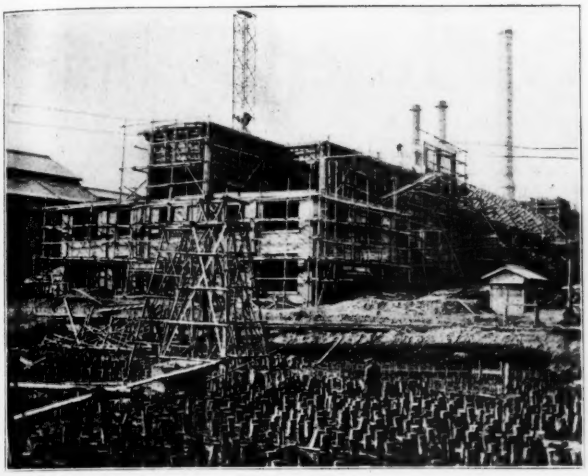


2 of the Asano Cement Co., Kawasaki, Japan

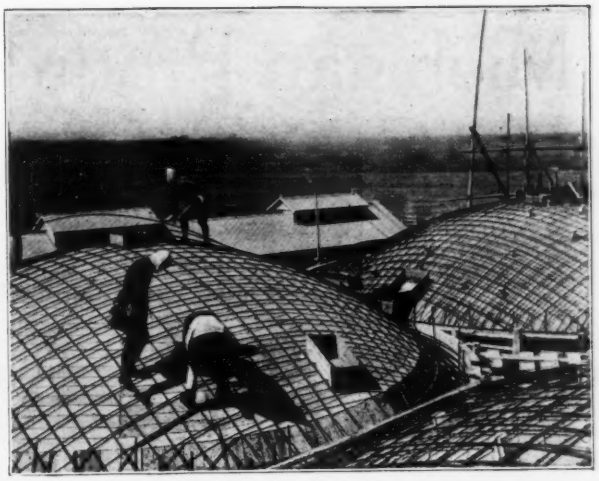




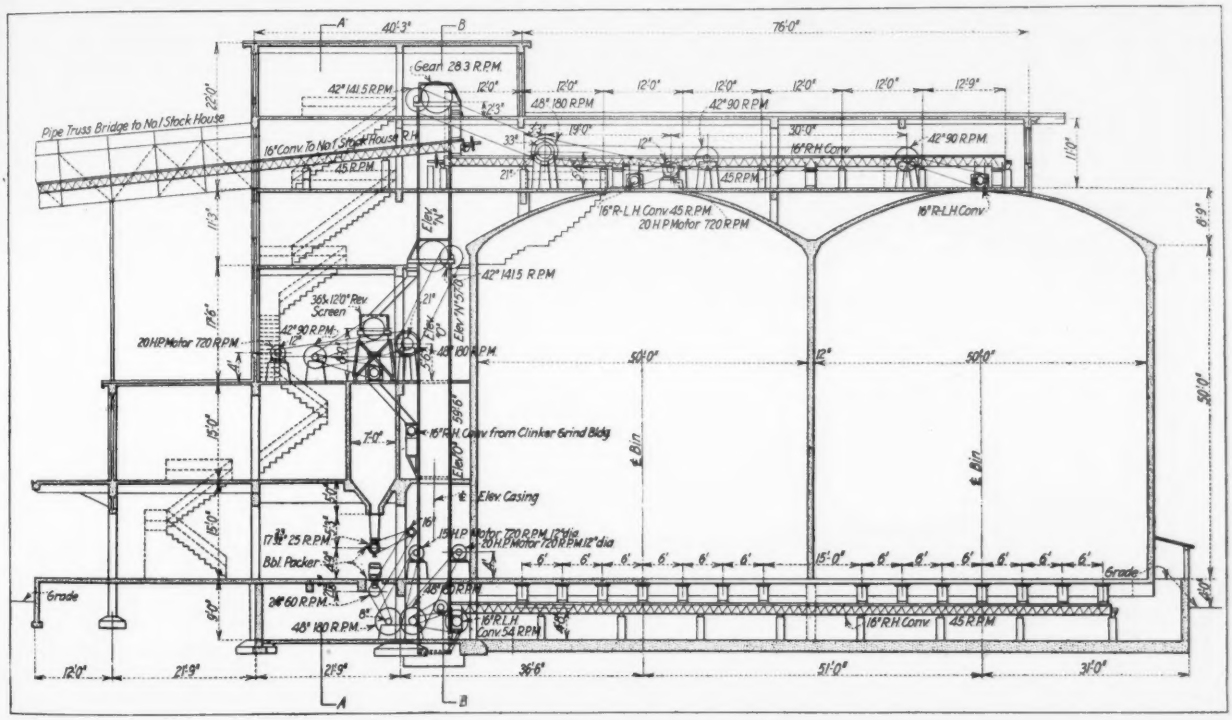
Above—Kilns, looking toward the burning platform. Below—The kilns and kiln piers



Piling for cement stock house in foreground



Reinforcements on dome over correction tanks



Longitudinal elevation of cement stock house

ing discharged from the compeb mills is reclaimed by an elevator which deposits it in a 16-in. screw conveyor located over the four correction tanks, which are 30 ft. in diameter and 40 ft. high, and which have a capacity of 21,042 bbl. Underneath each tank there are 4 feeders which discharge into a central 16-in. screw conveyor which takes it to an elevator, depositing it into two kiln feed bins ahead of the kilns. These bins have a capacity of 415 bbl. each.

It is the practice here to draw about twice as much material as is required to keep the kiln full at all times, the overflow going into an elevator which returns it back to the bins. In this way there is a complete circuit of material, which enables the chemist to have proper control of his mix at all times.

(To be continued)

A House Organ to Build Business

BUILDING confidence and good will through a house organ edited to and circulated among its customers is a recent step taken by the Luckey Lime and Supply Co. Luckey, Ohio. The first issue of this publication, which is planned as a monthly sheet, appeared in January, and contains the following announcement:

"We trust *Luckey Lime Logic* will carry a message of friendliness to you, as we realize that the essential part of salesmanship is in making friends and inspiring confidence. When we understand your needs and you appreciate our capabilities, a foundation is laid for successful business relations.

"Our hope is that *Luckey Lime Logic* will bring us into closer relationship. It will be laid on your desk every month—we trust it may be welcome."

Michigan Producers Present Their Case to State Commission

Secretary Bolender drew the brief on behalf of the governor of the state and the petitioners. He confidently expects a substantial reduction in rates within the next few weeks

ON behalf of the Governor of Michigan and the Michigan Sand and Gravel Producers' Association, Executive Secretary George J. Bolender filed on April 14 a brief with the Michigan Public Utilities Commission in connection with the fight for reduced rates on sand and gravel in that state.

"The hearing in this case lasted 6½ days," said Secretary Bolender. "The record was so long and there were so many exhibits that it was impossible to cover the matter comprehensively in a brief without making it entirely too long. I have endeavored to put into this brief the most important points made at the hearing and to show the commission the necessity of these materials in order that the industry may survive. I confidently expect a decision giving a substantial reduction in rates and I believe that the decision will be forthcoming within the next few weeks."

A brief summary of this case shows that the association filed a petition for modification of the order of the Commission in this proceeding effective May 21, 1921, which order prescribed for application in the Southern Peninsula of Michigan a certain so-called mamixum mileage scale for use in connection with the transportation of sand and gravel and crushed stone in intrastate traffic.

Hearings were begun on January 11 and 12 and on subsequent dates to March 14, when the hearing was concluded. At the request of the carriers there was filed on behalf of the petitioners, after the conclusion of the January 12 hearing, a statement of the matters which were alleged to be in violation of the law and concerning which it was proposed to introduce evidence, and also indicating the extent to which relief was asked by the petitioners. These issues were:

1. The present rates on sand and gravel in Michigan are excessive.
2. The reductions made by the Commission in establishing the scale are less than half the 22 per cent indicated in the order.
3. Improper mileage breaks and rate gradations in the scale.
4. Discriminatory method of fixing rates since the scale was established.
5. Increase in spread from minimum distance to distances of 100 miles or more.
6. Minimum weight per car as ordered by the Commission is unreasonable.
7. Violations of the order by respondents.

The extent to which the petitioners felt they were entitled to relief is indicated by the requested findings, which were:

1. Either—
(a) Reduction of present rates to basis of rates in effect prior to the advance of August 26, 1920, and further reduction of 10 cents per ton, or—
(b) Establishment of a maximum mileage scale which will reflect the rates indicated in proposal (a) above.
2. Reduction in minimum weight to 90 per cent of the marked capacity of the car.

At the beginning of the hearing of February 17 the proposal for change in the minimum weight per car was amended by the petitioners so that the proposal now reads:

"Reduction in minimum weight to 90 per cent of marked capacity of the car or publication of tariff permission to overload car 20 per cent."

Testimony in the various hearings was offered by five county and district highway engineers and by seven representatives of the producers, including Secretary Bolender of the State Association.

This brief amply substantiates the claim of the producers that the freight rates are prohibitive for gravel road construction and are restricting the movement of concrete construction; that the use of inferior materials is being compelled by the high delivery cost of prepared products, including the high transportation charges thereon; that under the present freight rates a large tonnage of sand and gravel has been diverted from the railroads and replaced by materials by river or truck.

O. S. Hess, county road engineer of Kent county, testified that the total number of miles and tons of material for the projects in his county that were handled by motor truck during 1921 were 57 miles of gravel roads and 188,455 tons of gravel. He used local material in preference to commercially prepared materials because they were cheaper. "We would have shipped over railroads," said he, "if the rate had been cheaper on a lot of these jobs."

Engineer Dana P. Smith of Cass county testified that he used more than 42,000 tons of local material and that only 6000 tons were shipped in.

Engineer R. H. Steketee, Kalamazoo county, said that in most cases the highway department would prefer commercial materials because they were more uniform and a better road would result.

Secretary Bolender testified that seven producers reported the railroad's loss of business through roadside pits and motor trucks due to high freight rates amounted to 832,450 tons. "The loss of revenue to the carriers in 1921 on Michigan sand and gravel traffic," said Mr. Bolender, "was not due to low freight rates, but to high freight rates." Figures from Cass, Kalamazoo and Kent counties show that less than 10 per cent of the 1921 consumption of material was shipped by rail. In two of these counties the tonnage dropped from 61,166 tons in 1920 to 31,789 tons in 1921, or nearly 50 per cent.

As the Michigan rate structure is so closely interwoven with the interstate rate structure throughout C. F. A. territory it is not improper to demand that the carriers justify their intrastate rates in Michigan, as it would be necessary for them to justify their interstate rates under section 18 of the Act to Regulate Commerce.

Since January 1, 1910, rates on sand and gravel have been increased more than 180 per cent and the only increases which have been justified under the provisions of the statute quoted were the 5 and 15 per cent advances. The advance under General Order 28, effective June 25, 1918, and the advance under Ex Parte 74, effective August 26, 1920, were not made with respect to the condition of the industry nor the ability of the shipper to pay, nor of the value of the commodity or the cost of service, nor of any other factor ordinarily entering into the construction of freight rates.

The only justification of the advances was the financial needs of the carriers. In this case there has been no testimony offered to justify the present high rates. Evidence introduced by witness Bolender that these commodities produced more earnings per unit of transportation service than is earned by other freight or by the average of all freight stands uncontradicted. It is conceded by the respondents that the value of these commodities is less than that of any other freight that moves in large volume, but no explanation is volunteered of the fact that

the average earnings on actual movements of sand and gravel are very much higher on the basis of any unit of transportation service than the average earnings on all traffic. There is no possible answer to this evidence except to admit that the rates on sand and gravel are unreasonably high.

It was also shown that the order of the commission prescribing a mileage scale and fixing rates for two and three line hauls has resulted in increasing materially the tonnage and consequently the revenue of the carriers.

In compiling freight figures as to the alleged laws of revenue and as to the percentage of reduction ordered by the Commission, the carriers have compared unlike things which they know are highly improper. The only way in which a correct estimate of the percentage of reduction can be made would be by a comparison of the charges on business actually moving since May 21, 1921, to points to which there were specific rates before that date with the earnings which would have accrued under such specific rates. If such a comparison were made the reduction ordered by the Commission would be found to be less than 10 per cent.

It is further claimed that the unjust rates complained of were made because of alleged financial necessity and the influence of such rates on the carrier's revenue. In this connection, it is interesting to note the observations made by the Public Service Commission of New York, Second district (case 7714, decided April 7, 1921), on the subject of the advances in sand and gravel rated under Ex Parte 74, which were then under suspension in New York and which advances were not permitted to go into effect:

> The contention that because more revenue is needed, increased rates should be charged for these commodities is not controlling; if so, any increase of rate proposed by a carrier would be justified. The fact that a smaller income is derived from the increased rates than was expected indicates that the traffic cannot stand up under an indefinite increase, but at some point an economic limit is reached, after which an increase results in a depletion rather than an increase in revenue. This would be the probable effect of the present rates on the commodity in question over the very substantial increases which were made thereon by the Director General of Railroads during Federal Control.

The prediction of the New York Commission that the traffic would not bear the increase provided under Ex Parte 74 has been verified by subsequent transportation history.

The opinion of the Ohio Commission in the case states that:

> The carriers have submitted very little evidence in this proceeding tending to justify the specific rates under attack. They have tried the case on the theory that the Commission's hands are tied by Section 15-A of the Interstate Commerce act, because they have been able to show, making allowance for seasonal variations, that during the first six months of this year they have failed to make the net return that Section 15-A contemplated. Their argument is not convincing and it does not follow because they have failed during the first six months of this year to make a net return on the book or estimated value of their property, at the rate of 6 per cent annually, that the present freight rates on sand and gravel and crushed stone and paving block are just and reasonable.
>
> It seems a majority of the railroads today regard rates and revenue as synonymous and some of their traffic officials have so energetically devoted their time to securing rate increases for the purpose of increasing revenues that they have apparently forgotten the importance of sometimes reducing rates to increase revenue.

More Telling Points

The 40-cent minimum proposed by the petitioners in this proceeding was ridiculed by the carriers, but no word of testimony was offered to the effect that it was unreasonably low.

If 60 cents be a reasonable rate for the transportation of coal for 30 miles in Indiana, then any rate in excess of that amount is unreasonable for the transportation of sand and gravel for the same distance in Michigan.

Witness Bolender: "I told the Commission that it was my opinion that there would be no new rate established in Michigan less than the scale. There has been to my knowledge none established under the scale, except those in Detroit, some of which were influenced by the Detroit situation."

Different rates would not be asked for sand and gravel than for crushed stone, but the petitioners do object to the maintenance of rates on slag at the same level as the rates on sand and gravel.

The public has an interest in the level of freight rates on road building material, for the freight is always paid by the consumer, who is the taxpayer. The freight rate alone is the controlling factor in diverting business from the commercial plant to the roadside pits, as has been amply demonstrated in this case.

The employment situation alone, other things being equal, would be sufficient to warrant this commission in making a very substantial reduction in the rates on road building material.

The petitioners feel that the solution of the problem is to return to the check-in basis of making rates—that is, making the rates with the view not only to the carriers' revenue, but to the necessities of the situation. There are too many factors in the making of freight rate in the state to make all the rates on the same level.

Conclusion

The Michigan roads need revenue and the petitioners need a reduction in rates in order that they may live. The state highway department and the taxpayers need highway improvements at a just and reasonable cost. The unemployed need work. Every city needs building construction. And every interest can be served by a substantial reduction in the freight rates.

No single act within the power of the Commission will do more to stabilize commerial conditions and restore business now lost than a decision granting in full the relief requested.

Annual Meeting of Ohio Sand and Gravel Producers

ONE of the best meetings in the history of the Ohio Sand and Gravel Producers' Association was held on April 13 at Columbus, Ohio. It was devoted principally to the consideration of practical and timely matters. Probably the most important action taken was the withdrawal of the Ohio Association from the National Association as an association. This will become effective on July 1. Several new members have recently come into the association, reports Executive Secretary Guy C. Baker, and he also says that the coming year promises to be one of the best in the association's history. The annual dues were reduced from 4 mills to 2 mills per ton.

The following officers were elected: President, F. E. Hall, T. J. Hall & Co., Cincinnati, vice-president, E. A. Evans, Zanesville Washed Gravel Co., Zanesville; secretary-treasurer, F. C. Fuller, Portsmouth Sand and Gravel Co., Portsmouth; executive secretary, Guy C. Baker, Greenville Gravel Co., Greenville; Directors, R. E. DoVille, DoVille Lake Sand and Gravel Co., Toledo; F. D. Coppock, Greenville Gravel Co., Greenville; Harry Donnelly, Ohio Gravel Ballast Co., Cincinnati; Frank Tejan, Wiggim Crushed Stone and Sand Co., Germantown, and H. R. Gill, Island Sand and Gravel Co., Columbus.

Hydrated Lime Investigations Planned

TO get a better understanding of the results of using hydrated lime in various percentages in concrete mixtures, the Illinois Highway Department is planning on making tests on specimens in which this material is incorporated. Approximately 200 specimens to be used for transverse, compressive and wear tests have been made and are now in storage preparatory to being broken at the end of 30 and 60 days.

The lime was placed in percentages of 2½, 5, and 7½, in two sets, the only difference in the sets being that in one case fine sand was used in the mir, while in the other coarse sand was employed. The coarse aggregate was of the same gradation in both sets of specimens. As the investigation has to deal with the added density of the concrete through the incoporation of the lime, the differences in the sands should bring about interesting results.

Domestic Graphite Production

THERE was a decrease of 88 per cent in the sales of domestic crystalline graphite in 1921 and a decrease of 61 per cent in the sales of amorphous graphite as compared with 1920.

The Benefits of Association Work

Secretary Hoover outlines the public advantages of co-operative effort, shows how the small business profits, and condemns the open-price plan

LEGISLATION vesting authority in a government agency to advise business in advance as to the legality of a proposed course of conduct was advocated by Nelson B. Gaskill, chairman of the Federal Trade Commission, in an address before a conference of trade association representatives convened on April 12 by Secretary of Commerce Hoover.

Mr. Gaskill was one of a number of speakers who urged the need of a revision of anti-trust laws to clear up doubts surrounding the "twilight zone" of business conduct.

Mr. Hoover and William E. Lamb, solicitor of the Department of Commerce, both took occasion to emphasize the fact that the department has nothing to do with the administration of anti-trust laws and that it is merely trying to assist in disseminating to the public such additional statistics relative to production, consumption and related matters which the industries of the country voluntarily wish to furnish.

Mr. Hoover said in part:

"The legitimate associations in industry and commerce have been well proven to be in public interest. We need only to examine the many functions of the 2000 organizations to demonstrate this.

"There is one generalization in connection with this movement that has been mostly overlooked. The trade association, in membership, is predominately made up of the smaller establishments. Big business can employ its own agents in all these matters. It can establish its grades of standards, it can employ its own research laboratories. Little business can only hope to be equally informed and make equal efforts to promote its welfare through trade association.

"The law provides that the Secretary of Commerce shall promote trade, industry and transportation. In the reorganization of the Department of Commerce, that it might become of far greater real service to our whole public, we have sought to co-operate with industrial and commercial organizations, agriculture and labor in promotion of marketing abroad, in employment, in transportation, in elimination of wastes and improvement of our industrial technology, statistical services and information and in many other directions.

"These problems become practical problems of day to day contact with commerce and industry if we would learn the direction in which real service can be accomplished. Such contact can only be secured through trade and industrial organizations, for without organization there can be no representation. We hold that legitimate trade association work is vital and should be encouraged.

"Certain doubts have been raised as to the right purpose of all trade associations during the past year by the exposure of a few groups that have taken advantage of the benevolent purposes of trade association work as a cloak to create combinations through which they not only restrained trade, but some of them also became the nuclei of corruption. I wish to state at once that a canvass of nearly 2000 trade associations showed that only a small minority were engaged in those functions which lay the foundations upon which restraint of trade is suspicioned.

"Recently this department addressed to the Attorney General certain questions for its guidance in its relation to various functions of associations and received his views thereon, which have been communicated to the public. I cannot, nor would not, add nor subtract anything from what the Attorney General has stated. This conference was called at the request of many associations who wished to present their views upon the relations of their associations to this development. This department cannot interpret the law and has no intention of doing anything of the kind.

"It is obvious that the Department of Commerce cannot establish co-operative relations with associations who maintain types of practices that have been condemned by the courts. Beyond this again there are some two or three functions carried on by a small minority of trade associations, the legality of which has been questioned but not yet determined. These are in the main the so-called open-price associations which are collecting data on prices and sales of their individual members, and circulating such individual data again to their members together with certain other activities.

"I wish to state frankly and at once that the officers of the government do not believe that these functions are in public interest, whether they are used in violation of the law or not. The department laid down the rule nearly a year ago that it could not co-operate with associations subject to such criticisms and sees no reason to change it.

"Statistical information as to productivity and national stocks is needed not alone by the man in a particular industry, but the same information is needed by men in other industries and it is needed by every agency of the Government.

"A study of the trend of production and consumption does not imply restraint of trade. If it does, then the whole statistical basis of commerce that fills one-third of our newspaper space would need to be abolished. If we abolished it we would be bankrupt in 10 years.

"The matter that I am principally interested in is that this information should be available to the whole public. It is the old question as to whether a community will succeed if it acts in ignorance or if it acts in knowledge."

Stone and Gravel Roads for Indiana

ALTHOUGH no action was taken, the State Highway Commission recently discussed the secondary road system in Indiana, as included in the 1922 construction program outlined recently. A number of miles of secondary roads of gravel or stone are to be built by the commission, which is in accordance with Governor McCray's wishes as he favors this type of road where the traffic is light enough to carry it. The commission has reserved approximately $1,500,000 for building gravel and stone roads in the state.

To Report on Trade Associations

THE appointment of a committee to study and report on the subject of trade associations was announced on April 4 by the Chamber of Commerce of the United States. The committee will direct its inquiry with a view to determining in what manner trade associations can render the greatest service to business and the public. It held its first meeting at the headquarters of the chamber in Washington on April 5.

Selling for Ballast

THE producer of gravel, stone, or slag who hasn't found a market for all the material he can produce may see an opportunity to sell to steam or electric railroads for ballast purposes. Well-planned selling will in many cases convince railroad engineers that it's cheaper to buy at a contract price than to produce and accept all the risks.

The figures below, taken from the report of the committee on ballast of the American Railway Engineering Association, as presented at the convention of that association last month, will give an idea of costs which will help the producer of ballast to approach railway engineers intelligently in selling material for ballast purposes.

SUMMARIZED STATEMENT OF BALLAST OPERATIONS DURING THE YEAR 1918 FOR ROAD NO. 11

(167.5 miles of track ballasting during the year 1918. Gravel ballasting, average lift 4 to 6 in. Cost of train haul, $87,630.32. Total cost, $375,229.31)

RATE OF WAGES PAID EXTRA GANG MEN AND MEN EMPLOYED IN TRAIN SERVICE

	Per Day		Per Day
Extra gang foreman	$7.15		
Extra gang laborers	3.00	Watchman	$3.40
Steam shovel engineer	6.32½	Cook	3.00
Steam shovel crane man	4.95	Rapid unloaderman	4.70
Steam shovel fireman	3.50	Pit man	3.50

COST OF BALLASTING, SEVEN DIFFERENT DISTRICTS, IN 1919

	Dist. A	Dist. B	Dist. C	Dist. D	Dist. E	Dist. F	Dist. G
Average distance hauled in miles	60	165	120	6	50	35	32
No. of cu. yd. supplied during yr.	114,548	135,433	33,976	14,908	7988	5411	14,274
Miles ballasted during year	48	83	11	5½	5	6	9¼
Items of Cost Per Cu. Yd.							
Cost at Source of Supply:							
(a) Fixed charges for pit	$.007	$.0002	$.021	$.021	$.065	$.065	$.060
(b) Operation of pit	.2216	.0018	.149	.239	.458	.451	.379
Freight charges (cost of hauling ballast).. (Switching charges included in above.)	.1994	.3132	.336	.089	.197	.208	.275
Unloading and spreading	.1722	.1741	.153	.065	.213	.302	.171
Other expenses (applying ballast)	.5261	.5906	.280	.311	.346	.116	.393
Grand Total	$1.125	$1.275	$0.939	$0.72½	$1.279	$1.142	$1.278

Michigan to Buy Cement from Manufacturers

THE plan of State Highway Commissioner Frank P. Rogers has been approved by the Michigan Administrative Board to buy this year's supply of cement direct from the makers. This plan, it is said, will save the state about $200,000 as the cement can be bought 10 cents a barrel cheaper from the manufacturers than the contractors can buy it. An additional 10 cents can be saved if the bills are paid in 10 days. The state will use a million barrels during 1922.

Bedford Stone Club Enters Appearance in Suit

ATTORNEYS representing the defendants in the suit filed in the Superior court, in Indianapolis against the Bedford Stone Club Auxiliary, Inc., and 18 alleged members by Attorney-General U. S. Lesh, have entered their appearance in the case. The suit charges the existence in Indiana of an unlawful combination of companies which controls the quarrying and sale of Indiana limestone, and asks for a permanent injunction preventing a continuance of the alleged "combination and conspiracy," that the corporate charters and franchises of the companies be revoked and for the appointment of receivers.

Arthur W. Stone, New York City, entered his appearance for the Hoosier Cut Stone Co., and the George Doyle Corp.; Pickens, Moores, Davidson and Pickens, Indianapolis, Clark & Brooks, Bedford, Louis E. Hart and James E. Wilkerson, Chicago, filed appearances to represent the other defendants, the International Cut Stone Contractors and Quarrymen's Association, Inc.: Imperial Cut Stone Co., Central Oolitic Stone Co., Consolidated Stone Co., J. R. Falt Co., Furst-Kerber Cut Stone Co., J. Hoadley & Sons Co., Interstate Cut Stone Co., Matthews Brothers Co., Perry Stone Co., John R. Rowe Cut Stone Co., Shea & Donnelly Co., Henry Struble Cut Stone Co., Hoosier Cut Stone Co., C. Ittenbach Co., and Edward F. Dux.

Building Officials and Limestone Producers to Hold Joint Meeting

A JOINT meeting of the eighth annual meeting of the Building Officials' Conference and the Indiana Limestone Quarrymen's Association will be held on Thursday morning, April 27, in Indianapolis, when T. J. Vernia, president of the limestone association, will discuss the "Use of Indiana Limestone in Building." H. S. Brightly, service engineer of the association, will open the discussion.

A visit will be made the day following by the conference members to the limestone quarries and mills at Bedford, Ind., as guests of the association. A. J. R. Curtis, of the Portland Cement Association, will be another speaker. Several changes are expected to be recommended by the building code committee which makes its report during the first of the four-day session.

Progress of Bates Experimental Road

ATTENTION is called to the progress of the Bates Road experiment at Springfield, Ill., by Secretary Yeoman, of the Indiana Sand and Gravel Producers' Association. He says:

"A number of the sections have broken up badly. The failures are from the base up rather than from the top down. None of the concrete sections have been seriously injured, although some are only 5 in. thick. Testing operations were suspended during the last few days on account of the rain, it being impossible for the operators to work in a blinding rain storm.

"It is interesting to note that the moisture content of the soil under the pavement is 32 per cent after all this rain, which is 8 per cent lower than it was late last fall. Make an effort to see this road within the next two weeks if you can; it will be worth your while. A more complete story will reach you later."

I. C. C. Vacates Order Countermanding Indiana Commission's Action

THE order of the Indiana Public Service Commission allowing 10 cents of the Ex Parte 74 increase in rates has been vacated, and in turn the Interstate Commerce Commission has vacated its order countermanding the Indiana Commission's action.

This removes the conflicting orders of the two commissions. It is hoped, says the news letter of the Indiana Sand and Gravel Producers' Association, that, following this action, the authority of the Indiana Commission may be restored.

Preheating High-Speed Tools

THE Bureau of Standards is testing a number of ½-in. lathe tools made of several brands of high-speed steel. One interesting point brought out in the early work is the apparent influence of preheating before hardening. Using the average of four tools, made, heat-treated and tested under the same conditions, except for preheating temperature, the results were as follows:

Preheated 20 Min. at	Hardening Heat (5 Min.)	Quenching Medium	Pounds of Metal Cut
1400 deg. F.	2417 deg. F.	Oil	9.1
1500 deg. F.	2417 deg. F.	Oil	10.1
1600 deg. F.	2417 deg. F.	Oil	5.1
1600 deg. F.	2417 deg. F.	Water	5.1

The steel in question analyzed 0.6 per cent C, 3.5 per cent Cr, 15.5 per cent W and 1.6 per cent Va.

Quarried from Life

By Liman Sandrock

Oh, Cuba and Thy—(Roll Your Own!)

THE moment one mentions Cuba these arid days, we immediately have visions of— Let's talk about Cuba's cerulean skies, its tropic starry nights, its

George J. Nattkemper

stately palms, the lure of the Casino, the main points of this story:

Back in February, George J. Nattkemper, vice-president of the National Association of Sand and Gravel Producers and guiding spirit of the Summit Sand and Gravel Co., over to Terre Haute, accompanied by Mrs. Nattkemper, attended the New Orleans convention.

It may be that "the rigors of our Northern clime" first gave the impulse to revel in tropic delights, but, however it was, a Cuban trip was decided upon, the party including Mr. and Mrs. J. W. McGrath and T. E. McGrath, of the McGrath Sand and Gravel Co., Lincoln, Ill., and Mr. and Mrs. Charley Biesanz, of the Biesanz Stone Co., Winona, Minn.

We can picture our friends on the ship leaning over the rail (by no means inwardly disturbed) and gazing upon the sun-kissed waves, forgetting all else but a good time.

Americans are noted the world over for their versatility (C. Dickens commented upon it, disparagingly, it is true). Of course, our Cuban tourists lived up to this trait. One evening, a midnight supper at Havana's Monte Carlo, the Casino; the next day, a sedate trip to the spot where Columbus was first interred. From gay to grave, in a manner of speaking.

Even the native methods of finance were taken under consideration, during their stay, and they came to the conclusion that "the Cuban has no sense of the value of a dollar"—it is an economic truth that sense makes the dollar, whichever way you spell it.

On the return from Cuba two days were spent in Key West, thence to Miami and Jacksonville, and then—Home!

To us who are swept by soft-coal breezes, tortured by streetcar clangor and looking darkly through the sicklied sunshine from a Chicago office building, these good folks must have tasted of Paradise. Welcome home, folks!

O. C. "Lets Down the Bars"

THE world is indebted to Jamie Boswell—Doctor Samuel Johnson's Boswell—for "the most minute account of a man's life that has ever been written." We have Lord Macaulay's word for it that Boswell even included Johnson's "St. Vitus dance, his mutterings, his gruntings." Well, we are no Boswell, so our "biography" of Executive Secretary O. C. Hubbard of the Wisconsin Mineral Aggregate Association will be a plain, unvarnished tale, minus minuteness and embarrassing particularity.

Brother Hubbard's earliest experience in the industry began when he fished in an abandoned quarry of the W. D. Meyer Co., at Quincy, Ill., where he must have swallowed hook, line and sinker. After a becoming hiatus, we discover O. C. making territory with Schaff of Springfield and Ted McGrath of Lincoln, Hubbard selling cement and Schaff and Ted on a still hunt for sand and gravel orders. For, "we knew them when—"

Later, Hubbard was selected as secretary by the five men who organized the Wisconsin Association. O. C. says that since then his personal development is "a head of snow-white hair, with a slight baldness near the front." (Our photographer was good to him!)

What the association has gained can be easily conceived when we consider that today it is a lusty, flourishing four-year-old child, with nearly all its original nurses having $10,000 to play with—a reserve greater than either of the national aggregate associations.

Sports? He likes them all. He's a golf bug, a baseball fan; he bowls, indoors and on the green; curls on the ice; has been tempted by the galloping dominoes; knows card games, to his cost, and has chalked many's the billiard cue. Our hero says he smokes, chews, drinks, swears, in gentlemanly moderation, but as we know that he is chairman of the entertainment committee of Wauwatosa's Congregational Church Men's League, we feel that our Johnson is kidding his Boswell to his own detriment.

It's in the Hubbard blood to be a salesman. O. C. was, for 12 years—and so were his grandad, his dad, and his brothers. Talking with him, you get the impression that, if given sufficient publicity,

The secretary of the Wisconsin Mineral Aggregate Association

he could sell fertilizer in capsules to cure corns. That's optimism for fair, and offers fresh fields for fertilizer—when the others have been fed up.

Some near day, if Pussyfoot Johnson does not beat you to it, go to Milwaukee and check up on Brother Hubbard, just to prove that the Wisconsin Mineral Aggregate Association lives up to its motto, "It must be screened and clean."

HE (on renewing his subscription to ROCK PRODUCTS): Enclosed is my check for two years. Kindly address it to me personally, and not the company. My partner has a mortgage on brains and ideas; sending the paper to him is superfluous.

Editorial Comment

Ship While Shipping's Good

Make hay while the sun shines! Ship your stone, sand, gravel and slag while cars are to be had. There is a nation-wide coal miners' strike in progress. The weekly production of bituminous coal is about a million and a half tons per week instead of the regular ten million tons per week. The production of anthracite is nil. Nobody seems worried about the present supply of coal, and it looks as though the strike may last a long time.

The same shortage of open-top cars that caused so much grief to mineral aggregate producers in 1920 exists today. More cars have been ordered but few have been delivered. Today, practically all open-top cars are available for shipping aggregates. Tomorrow, as "sure as shooting," they will all be needed to catch up on the winter coal supply. Conditions in the fall of 1922 bid fair to be much the same as in the fall of 1920. Most producers realize this. Drive it home to contractors and highway engineers!

Know the Facts

Producers of agricultural limestone may take to heart the principles expressed in the editorial following. The situation in this industry is, however, a little different. There is not yet enough agreement among authorities as to the qualities of limestone of various degrees of fineness to say that one quality of limestone is inferior to another in dollar-for-dollar value.

One section has been educated to demand a finely ground product at a higher price; some other section requires a low-priced product without regard to fineness.

If a farmer, expecting the results which only the finely ground stone can give, is sold a coarser product on the argument of price alone, then the seller lays himself open to the charge of being unscrupulous. But if the buyer fully understands what he is getting and doesn't expect of the material results he cannot get, then the deal cannot be subjected to criticism.

What is needed in this industry is more research, more investigation, more scientific study. The program is a stupendous one and scarcely possible without the co-operation of every interested agency, public and private, but it is the producers themselves who should take the initiative in instigating—and to whatever degree possible in carrying out—such research work. On that depends the sure and sound development of the industry to justify present investments and to stimulate added growth.

Spread the Truth

Here and there in the country an example may be found where educational work among users of sand and gravel has brought about an appreciation of the need of proper materials for aggregates. But these examples are far too infrequent, and even in the sections where clean graded material is demanded by the larger consumers, there remain hundreds of smaller users to whom the truth has not been convincingly spread.

The harm to the commercial producer lies in the loss of business to roadside pit producers, who are ever a thorn in his flesh. But the consumer is equally a victim if he buys dirty, poorly graded material, not knowing that it will make weak, unsatisfactory and more expensive concrete than if he had used higher-priced, well-graded material.

It is the business of the commercial producer, individually, collectively, and through associations, to spread the gospel of good materials to protect himself and the consumer as well. The roadside pit producer may be ever so honest and upright; so long as he produces and his customer buys ignorantly, the harm will go on.

More co-operation, more investigation, and more promotion of the truth-spreading activities will do much to put clean, graded gravel in the position it deserves.

Selling Agstone

Not long ago a difference of opinion arose as to the selling ability of agricultural limestone producers. Naturally the producers did not agree—and quite properly—that they lacked selling ability, and hearty denials were made.

In the last issue of Rock Products an article "Selling More to the Farmers" dealt at length with the marketing problems of agstone producers. That article received a number of warm commendations and at least one severe criticism.

In other words, the uncertainty and differing opinions of agstone properties referred to in the editorial above extends to the selling of the product as well. Actually, this selling uncertainty is undoubtedly a direct result of the lack of scientific knowledge of the properties referred to. If producers could show the farmers authoritatively and conclusively what agricultural limestone of various qualifications will do, there would be little difficulty in selling a suitable product at a price that would profit both producer and farmer.

Investigate, study, determine the properties and the value of the product, and the difficulties of selling will remove themselves.

Hints and Helps for Superintendents

Ohio Quarry's Method of Suspending Electric Wires

An Ohio stone quarry is making use of portable racks or standards for carrying electric wires used in blasting, says *Engineering and Mining Journal-Press.* The rack is about 6 ft. high, weighs less than 100 lb. and can easily be handled by one man. Where several are used they are placed from 50 to 75 ft. apart.

The rack, consisting of three uprights that are braced at the base, is constructed of black iron pipe with a coating of black insulating paint, or of galvanized pipe. At the top the uprights are bolted together so as to form a tripod. Each upright is equipped with a short insulating sleeve and a porcelain knob insulator. The bolts holding these knobs in place are carefully insulated from the upright metal. A ballast plate is fitted on each base angle of the triangle so that boulders or other weights may be used for keeping the rack from being upset or blown over.

For the amount of current required by a blast drill hole of 220 or 240 volts, the weatherproof composition attachment plug has proven satisfactory. Both wires of an attachment plug base are soldered to each of the power wires. Likewise, both poles of an attachment plug "cap" are attached to each wire of the cable leading to the portable electrical machine.

How to Take Care of Gasoline Engines on Drilling Rigs

THE operator should take great pride in the adjustment and care of his engine, as this is the most vital part of the machine. If dependable service and high efficiency are expected, it is necessary that the engine be kept in proper adjustment.

To begin with, he should analyze the duties of each part and its functions. If this is not understood he cannot expect to maintain the proper adjustments. He must not depend too much on some one else. He should learn to help himself, especially in minor troubles. Keep the engine clean. Do not allow it to become coated with dirt and grease as this paves the way to electrical or ignition troubles by short-circuiting or grounding the current.

The main operating essentials are proper lubrication, fuel supply, compression, ignition and proper timing, any of which can cause considerable annoyance. As more oils are advertised for the lubrication of internal combustion engines than any other line of machinery, it is necessary that the proper selection should be made not how cheap it can be purchased, but by the service it will render. Never use the heavier steam engine oils; use the specially refined oils for gas engines, which are thinner and more free from carbon.

Always make sure of sufficient supply in the fuel tank and that it is delivering to the carburetor. Good compression is of vital importance, for without this economy and efficiency are decreased. Poor compression can be traced to insufficient cylinder lubrication, worn or leaky rings, and leaky valves. Valves in the average engine should be examined and reground two or three times a year.

The ignition equipment is the most delicate part of the engine, and invariably the least understood. It should not be disturbed any more than is absolutely necessary. Where the batteries are used in connection with a coil they should be frequently tested, and if any of them test less than 5 amp., they should be immediately replaced. A dead one in the series will help to deteriorate the others. See that all binder posts are kept tight, a loose connection will cause any amount of trouble and annoyance.

Make sure that the contacts on the engine are kept clean. Where a switch is used see that the blade makes a good connection with the binder post. The points on the vibrator must be kept clean. If they become pitted they should be redressed either with a piece of fine sandpaper or a fine file. Never use emery cloth as the grains of emery are metallic and will cause the points to fuse or burn. Where magneto ignition is used do not attempt to make any adjustments except on the points, and keep the commutator and magneto clean. If other troubles develop do not try to repair the magneto unless you are thoroughly familiar with its construction; something might be done which would ruin the instrument. Send the magneto to the factory where expert service will be obtained.

Do not "over-oil" the magneto as this has a tendency to saturate the armature and condenser and break down the machine. Under no circumstances change the timing of the engine from the original setting as this timing has been tested out by the manufacturer and found to be the most efficient. If the engine must be taken apart, be sure that the gears are so marked that there can be no doubt about their being put back correctly before disengaging them. Do not allow the engine to run with the journals loose, especially the connect-rod journals as this has a tendency to pound the wrist pin out of true.

The cylinder and cylinder-head bolts should be gone over occasionally as they should be set up tight at all times. In making repairs, replace the lock washers, nuts, and cotter pins, as they are safety appliances and should not be discarded.

Carbon deposits are caused from excess fuel or lubricating oils and engine in constant service should be taken apart at least once a year and the carbon removed from the explosion chamber and exhaust-valve ports. Where the cooling water contains much lime it will settle in the water jackets and fill the ports, cut down the circulation and cause the engine to run too hot. When this occurs the cylinder and head should be removed and the water jackets filled with a mixture of sulphuric acid and water and allowed to stand several hours. This will loosen the deposit when it can be scraped out more easily.

With strict adherence to proper adjustments the engine will respond by rendering better service, thereby eliminating loss of time, temper and patience, and reduce the cost of operation.

Flat and Troughed Conveyors

WHILE the flat-running belt will satisfactorily handle packages, boys, etc., and in many instances bulk material, the troughed belt usually increases the capacity.

Flat belts are not adapted to handling material of large size, particularly when the lumps are round and likely to roll. Again, if the belt is operating on an incline of, say, 15 or 20 ft. At such a pitch it is necessary to use sideboards to retain the load.

One of the main advantages of a flat belt conveyor is that the rollers, which are a series of closely placed pulleys, do not injure the belt. Any ply can be used which is suitable to the material and the method of feeding. The number of plies is limited only by the size of the head and tail pulleys—or the size of the tripper pulleys if a tripper is used.

Flat belts can handle only about half of the material conveyed by troughed belts and of the same width. And here it may be said that this deceased capacity is offset by the reduced first cost of the machinery and the increased life of the belt.

Accident Prevention

Quarry Accidents in the United States

By W. W. ADAMS, U. S. Bureau of Mines

THE Bureau of Mines is authorized to collect data relating to accidents at mines and quarries, but there is no law compelling operators to render such reports. Hence the promptness with which the operators have responded to the Bureau's inquiries indicate their realization of the importance of accuracy in statistical portrayals of the hazards of the industry in which they are engaged.

It is highly advisable that full and accurate data concerning quarry accidents be reported by operators not only as an aid to all persons interested in the study and prevention of such accidents, but also to assist state compensation commissions and other insurance bodies to arrive at premium rates that will be fair and equitable to the industry.

The quarries are classified according to the kind of rock—cement rock, granite, limestone, marble, sandstone and bluestone, slate and trap rock—and separate statistical tables have been prepared for each group and for all groups combined. In the year 1920 there were employed 86,488 men, of whom 178 were killed and 11,217 injured. Classified according to quarries:

Granite Quarries—There were employed 12,375 men, or 22 per cent over the year before. The total number of shifts worked was 3,199,073; each employe averaged 251 working days during the year, a loss of 2 days per man from the previous year's record. A larger number of shifts were worked in California, Massachusetts, Minnesota, New Hampshire, Rhode Island, and Vermont.

Accidents during the year resulted in 22 fatal and 1,392 nonfatal injuries, an increase of 6 and 291, respectively, over the record for 1919. The fatality rate was 2.06 per thousand 300-day workers as compared with 1.81 for the previous year, and the injury rate was 130.53 as against 124.70 in 1919. Most of the accidents were caused by flying objects, handling rock at face, machinery, haulage, and falls or slides of rock or overburden. Accidents inside the quarries showed a reduction in the injury rates (per thousand 300-day workers) from flying objects, handling rock at face, explosives, and drilling and channeling, whereas those at plants outside the quarries showed a decrease in two classes only, namely, accidents due to handling rock by hand and to hand tools.

Limestone Quarries in 1920 employed 43,151 men who worked 11,154,653 shifts, an average of 259 shifts per man. There were 925 companies operating limestone quarries in 1920 as against 952 the year before.

Accidents resulted in the death of 96 men and the injury of 5,321, an increase of 31 fatalities and 890 injuries. The accident rates for 1920 were 2.58 killed and 143.11 injured per thousand full-time or 300-day workers.

The number of fatalities due to haulage accidents and falls or slides of rock or overburden was increased. The nonfatal injury rate from accidents occurring inside the quarries showed a net increase of 10.22 per thousand men employed over the record for 1919. The increase in injuries among workers at crushers and rock-dressing plants was 7.21 per thousand employes. About half of all quarry workers in the United States in 1920 were employed at limestone quarries.

Cement-Rock Quarries.—The figures for quarries producing cement rock are based upon returns from 74 operators employing 13,251 men for a total of 4,249,485 shifts, an average of 321 working days per man. Twenty-nine per cent of the shifts were on quarry operations proper, while 71 per cent were outside the quarries, at the crushing plants, and cement mills.

Accidents during the year caused the death of 39 men and the injury of 2,585, which gives a fatality rate of 2.75 and an injury rate of 182.49 per thousand full-time workers (300,000 shifts). With two exceptions, explosives and haulage, all causes of accidents at quarries producing cement rock showed a reduction from the previous year's record in the number of persons injured per thousand employed. The net reduction for the year was 68.64 per thousand employes inside the quarries and 35.04 per thousand employed at outside works.

About 15 per cent of all quarry workers in the United States in 1920 were employed at cement-rock quarries.

(To be continued)

"Sand in Eye" Injuries

ADOPTION of goggles by the Florida East Coast Railway Co. as a means of eliminating "sand in eye" injuries, reduced these from 22 in January, 1921, when goggles were put into use, to 12 in January, 1922, according to an announcement just made by the efficiency organization of the road.

Haste Makes Accidents

THIS workman was in such a hurry to get out at quitting time that while running to shut down a mill he fell and broke his left arm. Then he stayed at home for 93 days for being so anxious to get there. He was in this plant for six years; inexperience was not an excuse.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.25	1.25	1.25	1.25	.....
Buffalo, N. Y.	1.50 per net ton all sizes—Winter prices from stock					
Burlington, Vt.	1.00	.....	2.50	2.00	2.00	.....
Chaumont, N. Y.	1.00	.....	1.75	1.50	1.50	1.50
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	1.25	.....
Coldwater, N. Y.	1.50 per net ton all sizes; fluxing stone 1.80 per ton					
Eastern Penna.	1.00	1.50	1.50	1.50	1.50	1.50
Munns, N. Y.	1.00	1.25	1.25	1.25	1.25	1.25
Western New York	1.00	1.25	1.25	1.25	1.25	1.25
CENTRAL						
Alden, Ia.	.80@1.00	.80@1.00	1.50	1.45	.....	.....
Alton, Ill.	2.00	.....	1.50	1.35	1.35	.....
Buffalo, Iowa	1.00	.....	1.15	.95	1.05	1.05
Chicago, Ill.	1.20	1.60	1.20	1.20	1.20	1.20
Dundas, Ont.	1.00	1.35	1.35	1.25	1.10	1.10
Greencastle, Ind.	1.00	1.15	1.05	1.00	1.00	1.00
Illinois, Southern	1.75	1.60	1.50	1.50	1.40	.....
Kansas City, Mo.	.60	1.60	1.60	1.60	1.60	1.60
Kokomo, Ind.	1.10	1.25	1.25	1.10	1.10	1.10
Krause or Columbia, Ill.	1.35	1.20	1.20	1.10	1.10	1.10
Lannon, Wis.	.90	1.00	1.00	1.00	1.00	1.00
Marblehead and Brillion, Wis.	1.10	.....	1.20	1.10	1.10	.....
Montreal, Canada	.85	1.20	1.10	1.05	1.00	.....
Montrose, Ia.	.....	1.50	1.60	1.55	1.50	.....
River Rouge, Mich.	1.00	1.10	1.10	1.10	1.10	1.00
Sheboygan, Wis.	1.00	1.10	1.10	1.10	1.00	.....
Southern Illinois	* 1.35	1.35	1.35	1.25	1.25	.....
Stolle, Ill. (I. C. R. R.)	1.30	.....	1.25	1.35	.....	.....
Stone City, Iowa	.75	.....	1.40	1.30	1.25	.....
Toledo, Ohio	1.60	1.70	1.70	1.70	1.60	1.60
Toronto, Canada	1.90	2.25	2.25	2.25	2.00	2.00
	Prices include 90c freight					
Valmeyer, Ill.	1.60	1.30	1.30	1.30	1.30	1.30
Waukesha, Wis.	all sizes 1.10 per ton					
SOUTHERN:						
Alderson, W. Va.	1.10	1.35	1.65	1.35	1.35	.....
Bromide, Okla.	1.50	.....	.....	1.50	1.50	.....
Cartersville, Ga.	.....	2.00	2.00	1.40	1.40	1.40
Chickamauga, Tenn.	.90	1.00	1.00	1.00	.90	.....
Dallas, Texas	1.00	1.00	1.00	1.00	1.00	1.00
Ft. Springs, W. Va.	1.00	1.35	1.60	1.35	1.35	.....
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Gainesville, Ga.	1.00	1.25	1.25	1.25	1.25	1.25
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	.....
Ladds, Ga.	2.00	2.00	2.00	1.50	1.50	1.50
Morris Spur (near Dallas) Tex.	1.00	1.25	1.25	1.25	1.25	1.00
Portland, Ga.	.60@1.00		(All other sizes 1.00@1.25)			
Shephard, Tenn.	1.00@1.25	1.00@1.25	1.00@1.25	.75@1.00	.75@1.00	.....
WESTERN:						
Atchison, Kans.	.50	2.10	2.10	2.10	2.10	2.10
Blue Springs and Wymore, Neb.	.20	1.65	1.65	1.55	1.45	1.40
Cape Girardeau, Mo.	1.50	.....	1.50	1.50	1.25	.....
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.40

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Bernardsville, N. J.	2.00	2 20	2.00	1.80	1.50	.....
Branford, Conn.	.60	1.50	1.25	1.15	1.00	.....
Bound Brook, N. J.	1.80	2.30	1.90	1.60	1.40	.....
Dresser Jct., Wis.	1.00	2.25	2.25	2.00	1.65	1.50
Duluth, Minn.	.90@1.00	2.25	1.90@2.00	1.40@1.50	1.30@1.40	1.25@1.30
E. Summit, N. J.	2.10	2.30	2.00	1.70	1.40	.....
Eastern Mass.	.60	1.85	1.60	1.50	1.50	1.50
Eastern New York	.80	1.40	1.40	1.30	1.30	1.30
Eastern Penna.	1.00	1.65	1.50	1.40	1.30	1.30
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60@ .80	1.60@1.75	1.50	1.25	1.10	.....
Oakland, Calif.	1.75	1.75	1.75	1.75	1.75	1.75
Richmond, Calif.	.50*	.....	1.75*	1.50*	1.50*	.....
San Diego, Calif.	.50@ .70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Springfield, N. J.	1.80	2.00	1.85	1.75	1.60	1.60
Westfield, Mass.	.60	1.35	1.30	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Alexandria Bay, N. Y.	1.60	.....	1.30	1.50	1.20	.....
Dell Rapids, S. D.—Granite	.75	1.85	1.75	1.70	1.70	.....
Dundas, Ont.—Flint	1.00	1.50	1.50	1.50	1.25	1.20
Eastern Penna.—Sandstone	.85	1.55	1.55	1.40	1.40	1.40
Eastern Penna.—Quartzite	.90	1.20	1.20	1.20	1.20	1.20
Holton, Ga.—Granite	.40	.....	2.50	2.25	2.25	2.00
Lohrville, Wis.—Cr. Granite	1.35	1.40	1.30	.....	1.20	.....
Los Angeles, Cal.—Granite	.....	1.25@1.50	1.15@1.40	1.15@1.40	.....	.....
Macon, Ga.—Granite	.50	.....	2.50	2.25	2.00	1.25@1.90
Middlebrook, Mo.—Granite	3.00@3.75	.....	2.00@2.40	2.00@2.65	.....	1.50@1.85
Red Granite, Wis.	1.35	1.40	1.30	1.50	1.20	.....
Sioux Falls, S. D.—Granite	.75	1.85	1.75	1.70	1.70	.....
Stockbridge, Ga.—Granite	.50	2 00	1.90	1.75	1.75	.....
Utley, Wis.—Red Granite	1.35	1.40	1.30	.....	1.20	.....

*Cubic yard. †Agrl. lime. ||R. R. ballast. §Flux. ‡Rip-rap. a 3-inch and less.

Agricultural Limestone

EASTERN:

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.00; bulk 2.50

Grove City, Pa. — Analysis, 94.89% $CaCO_3$, 1.50% $MgCO_3$—100% thru 20 mesh, 60% thru 100 mesh, 40% thru 200 mesh; in 80 lb. paper sacks, 4.50; bulk 3.00

Hillsville, Pa. — Analysis, 96.25% $CaCO_3$—75% thru 100 mesh; 85% thru 50 mesh; sacks, 4.50; bulk 3.00

Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$, 5.25% $MgCO_3$; sacks, 4.00; bulk 2.50

New Castle, Pa.—89% $CaCO_3$, 1.4% $MgCO_3$—75% thru 100 mesh, 84% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk 3.00

Osborne, Pa.—45% thru 200 mesh, 60% 100 mesh, 100% thru 20 mesh; 4.50 sacks; bulk 3.00

Texas, Md.—Analysis, 58.82% $CaCO_3$, 37.3% $MgCO_3$—50% thru 50 mesh; bags, 4.25; bulk 2.50

West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 5.00—cloth, 5.25; bulk.. 3.50

Williamsport, Pa. — Analysis, 88-90% $CaCO_3$, 2-4% $MgCO_3$—50% thru 50 mesh; paper, 4.75; bulk 3.75

CENTRAL:

Alton, Ill. — Analysis, 98% $CaCO_3$, 0.3% $MgCO_3$—90% thru 100 mesh.... 4.00

Bedford, Ind. — Analysis, 98.5% $CaCO_3$, .5% $MgCO_3$—90% thru 10 mesh ..... 1.60@2.00

Belleville, Ont. — Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk 2.50

Bellevue, Ohio — Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; ¼ in. to dust, about 20% thru 100 mesh..... 1.25

Bettendorf, Ia., and Moline, Ill.—97% $CaCO_3$, 1.5% $MgCO_3$—50% thru 100 mesh; 50% thru 4 mesh..... 1.50

Buffalo, Ia.—90% thru 4 mesh..... 1.00

Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.3% $MgCO_3$ (90% thru 50 mesh, 2.00), 50% thru 4 mesh..... 1.50

Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$—90% thru 4 mesh.... 1.00

Columbia, Ill., near East St. Louis—½-in. down ..... 1.25@1.80

Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh..... 1.80@3.80

Elmhurst, Ill. — Analysis, 35.73% $CaCO_3$,, 20.69% $MgCO_3$—50% thru 50 mesh 1.25

Greencastle, Ind. — Analysis, 98% $CaCO_3$—50% thru 50 mesh..... 2.00

Kansas City, Mo.—50% thru 100 mesh 1.50

Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh..... 1.35

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$—90% thru 50 mesh..... 2.00

Marblehead, Ohio — Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$—50% thru 60 mesh, 90% thru 70 mesh; bags, 4.50; bulk 3.00

Milltown, Ind. — Analysis, 94.41% $CaCO_3$, 2.95% $MgCO_3$—40.8% thru 100 mesh, 61.2% thru 50 mesh..... 1.40@1.50

Mitchell, Ind. — Analysis, 97.65% $CaCO_3$, 1.76% $MgCO_3$ — 60% thru 100 mesh, all thru 10 mesh..... 1.25

Montrose, Ia.—50% thru 100 mesh..... 1.35

Narlo, Ohio—Analysis 56% $CaCO_3$, 43% $MgCO_3$, limestone screenings, 37% thru 100 mesh; 55% thru 50 mesh; 100% thru 4 mesh..... 1.50@2.00

Ohio (different points), 20% thru 100 mesh; bulk ..... 1.25@1.50

Piqua, O.—100% thru 10; 90% thru 50; 70% thru 100..... 3.25@5.00

99% thru 10; 55% thru 50; 40% thru 100 ..... 1.75@2.00

River Rouge, Mich. — Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk..... .80@1.40

Stolle, Ill., near East St. Louis on I. C. R. R.—Thru ½-in. mesh..... 1.30

Stone City, Ia.—Analysis, 98% $CaCO_3$ 50% thru 30 mesh..... .75

(Continued on next page)

Agricultural Limestone

(Continued from preceding page.)

Toledo, Ohio—¼-in. to dust, 20% thru 100 mesh 1.50
Waukesha, Wis.—No. 1 kiln dried..... 2.00
No. 2 Natural..... 1.75
Whitehill, Ill. — Analysis, 96.12% $CaCO_3$, 2.5% $MgCO_3$—90% thru 100 mesh 5.00
90% thru 50 mesh..... 1.35
Yellow Springs, Ohio—Aanlysis 96.08% $CaCO_3$, 63% $MgCO_3$, 32% thru 100 mesh; 95.57%, sacked, 6.00; bulk.... 4.25

SOUTHERN:

Alderson, W. Va.—90% thru 50 mesh 1.50
Barber, Va.—Analysis, 92 to 98% $CaCO_3$—Bags, 6.50; bulk..... 4.50
Blowers, Fla.—Analysis, 98% combined carbonates—75% thru 200 mesh..... 4.75
Cape Girardeau, Mo. — Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$ — 50% thru 100 mesh 2.00
90% thru 4 mesh..... 1.50
Cartersville, Ga.—Analysis, all thru 10 mesh ..... 1.75@2.00
Claremont, Va.—Analysis, 92% $CaCO_3$, 2% $MgCO_3$—90% thru 100 mesh, 4.00; 50% thru 100 mesh, 3.00; 90% thru 50 mesh, 3.00; 50% thru 50 mesh, 2.75; 90% thru 4 mesh, 2.75; 50% thru 4 mesh..... 2.75
Ft. Springs, W. Va. — 50% thru 100 mesh 3.00
Hot Springs, N. C.—Agricultural limestone; sacks, 4.25; bulk..... 3.00
Knoxville, Tenn.—Pulverized 2.50
90% thru 100 mesh..... 2.00
90% thru 50 mesh..... 1.50
Ladds, Ga.—90% thru 50 mesh..... 2.00
Linnville Falls, N. C.—Analysis,, 53% $CaCO_3$; 42% $MgCO_3$—50% thru 100 mesh; sacks, 4.50; bulk..... 3.00
Mountville, Va. — Analysis, 76.60% $CaCO_3$, 22.83% $MgCO_3$—X thru 20 mesh; sacks 5.00

WESTERN:

Colton, Calif.—Analysis, 95% $CaCO_3$, 2-4% $MgCO_3$—all thru 14 mesh—bulk 4.00
Garnett, Okla.—Analysis, 86% $CaCO_3$, 50% thru 4 mesh ..... .50
Kansas City, Mo., Corrigan Sid'g—50% thru 100 mesh; bulk..... 1.80
Terminous, Calif. — Analysis, 97.3% $CaCO_3$, .04% $MgCO_3$—65% thru 200 mesh, 90% thru 100 mesh, 95% thru 80 mesh, 100% thru 50 mesh; sacks, 5.00; bulk 4.50
Tulsa, Okla.—90% thru 4 mesh..... .50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:

Baltimore, Md. ..... 2.25@2.75
Berkley Springs, W. Va..... 1.75@2.00
Cedarville and South Vineland, N. J.—Damp, 1.75; dry..... 2.25
Cheshire, Mass. ..... 5.00@7.00
Dunbar, Pa.—Damp 2.00
Hancock, Md.—Damp ..... 2.50@3.50
Klondike and Pacific, Mo..... 1.75@2.50
Mapleton, Pa. ..... 2.25@2.50
Massillon, Ohio 3.00
Millington, Ill. 1.75
Mineral Ridge, O..... 2.50
Green 2.25
Montoursville, Pa..... 1.75
Oregon, Ill.—Glass sand..... .75
Pittsburgh, Pa.—Dry, 4.00; damp..... 3.00
Rockwood, Mich. 2.75
Round Top, Md.—(washed-screened)..... 1.25
St. Mary's Pa.—Unwashed..... 2.00
Thayers, Pa. 2.00
Utica, Ill. ..... 1.00@1.25
Zanesville, Ohio ..... 2.00@2.50

FOUNDRY SAND:

Albany, N. Y.—Sand blast..... 4.00
Molding fine and brass molding..... 2.00
Molding coarse 1.75
Allentown, Pa.—Core and molding fine 1.50@1.75
Arenzville, Ill.—Molding fine..... 1.40
Beach City, O. — Core, washed and screened ..... 2.00@2.50
Furnace lining ..... 2.50@3.00
Molding fine and coarse..... 2.25@2.50
Cleveland, O.—Molding coarse..... 1.50@2.00
Brass molding ..... 1.50@2.00
Molding fine ..... 1.50@2.25
Core ..... 1.25@1.50
Columbus, O.—Core ..... .30@1.25
Sand blast ..... 4.50@5.00
Furnace Lining 2.00
Molding fine ..... 2.00@2.75
Molding coarse ..... 1.75@2.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Ambridge and So. Heights, Pa.	.....	1.15	1.15	1.15	.70	.70
Buffalo, N. Y.	1.10	.95	.85	.85	.85	.85
Erie, Pa.	1.00	.....	1.00	.....	1.25	.....
Farmingdale, N. J.	.48	.48	1.30	1.30	1.20	.....
Hartford, Conn.	.90	.....	1.25	1.15	1.15	1.15
Leeds Junction, Me.	.....	.50	1.75	1.50	1.35	1.25
Ludlow, Mass.	.75*	.75*	1.70	.....	1.50*	1.50*
Philadelphia, Pa.	.75	.75	.....	1.40	1.25	.....
Pittsburgh, Pa.	1.15	1.15	1.15	1.15	.70	.70
Portland, Maine	.....	.50	1.75	.....	1.35	1.35
Texas, Md.	.....	1.00	.....	Pure white sand, 1.50		
Washington, D. C.	.60@ .75	.60@ .75	1.60@2.00	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.	.....	.85	.....	.....	.....	.....
Anson, Wis.	.40	.40	.....	.....	.....	.90
Attica and Covington, Ind.	.90	.90	.90	1.00	1.00	1.00
Barton, Wis.	.....	.60	.70	.70	.70	.70
Beloit, Wis.	.....	.50	.....	.....	.50	.....
Chicago, Ill.	.....	1.75@2.23	1.75@2.43	.....	.....	.....
Cincinnati, Ohio	.70	.65	.90	.90	.90	.90
Columbus, Ohio	.....	.75@1.00	.75@1.00	.75@1.00	.75@1.00	.75@1.00
Des Moines, Ia.	.50	.40	1.50	1.50	1.50	1.50
Detroit, Mich.	.65	.65	.95	.95	.95	.95
Earlestead (Flint), Mich.	.70	60-40 sieves, .85; Pebbles, .95				
Eau Claire, Wis.	.40	.....	1.25	.....	.90	.....
Elkhart Lake, Wis.	.70	.58	.90	.90	.72	.72
Ft. Dodge, Ia.	.....	1.22	.....	2.17	.....	.....
Grand Rapids, Mich.	.....	.50	.....	.80	.....	.70
Greenville, Mechanicsburg, O.	.60	.50	.50	.50	.60	.60
Hamilton, Ohio	.90	.90	.....	.....	.90	.....
Hawarden, Ia.	.....	.50	.....	.....	1.60	.....
Hersey, Mich.	.....	.50	.....	.....	.80	.....
Indianapolis, Ind.	.60	.60	.....	1.50	.75@1.00	.75@1.00
Janesville, Wis.	.....	.65@ .75	.....	.....	.65@ .75	.....
Le Mars, and Doon, Ia.	.....	.90	.....	1.80	.....	.....
Libertyville, Ill.	.....	.70	.....	.70	.70	.....
Mankato, Minn.	.40	.40	.75@1.25	.75@1.25	.75@1.25	.75@1.25
Mason City, Ia.	.65	.55	1.70	1.60	1.60	1.55
Milwaukee, Wis.	1.06	1.06	1.26	1.26	1.26	.....
Minneapolis, Minn.	.35	.35	1.35	1.25	1.25	1.25
Moline, Ill.	.60	.60	1.20	1.20	1.20	1.20
Riton, Wis.	.....	.60	.....	.70	.70	.70
St. Louis, Mo., f. o. b. cars	1.10	1.30	1.50	1.30	.....	1.25
St. Louis, Mo., delivered on job	2.05	2.20	2.35	2.15	.....	2.10
Summit Grove, Clinton, Ind.	.60@ .65	.60@ .65	.60@ .65	.60@ .65	.60@ .65	.60@ .65
Terre Haute, Ind.	.75	.75	.75	.75	.75	.75
Waukesha, Wis.	.60	All other sizes, .70 per ton				
Winona, Minn.	.50	.50	1.50	1.25	1.25	1.25
Yorkville and Moronts, Ill.	.80	.60@ .80	.60@ .80	.60@ .80	.60@ .70	.60
SOUTHERN:						
Alexandria, La.	.60@ .80	.50@ .75	.....	.....	.85@1.50	1.20@1.50
Birmingham, Ala.	1.48	all gravel—1.88				
Charleston, W. Va.	(Sand, 1.40@2.50; gravel, 1.50@2.75)					
Estelle Springs, Tenn.	1.15	1.00	1.00	1.00	.85	.65
Ft. Worth, Tex.	.....	2.00	.....	2.00	.....	2.06
Jackson's Lake, Ala.	.50@ .60	.50@ .60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	1.00	1.00	1.75	1.75	1.75	1.75
Lake Weir, Fla.	.....	.60	.....	.....	.....	.....
Macon, Ga.	.....	.50@ .75	.....	.....	.....	.....
Memphis, Tenn.	1.12	1.12	.....	.....	.....	1.95
N. Martinsville, W. Va.	.....	1.00	.....	1.20	.....	.80
New Orleans, La.	.....	.50	.....	.....	1.00	.....
Pine Bluff, Ark.	1.25	.80	Washed gravel, all sizes, 1.75			
Roseland, La.	.25	.....	.85	.....	.....	.....
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Jedburg, Mo.	.70	1.20	.95	.75	.75	.70
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton, Missouri River, .85)					
Los Angeles, Calif.	.....	.75	1.25	1.25	1.15	1.15
Niles, Calif.	1.00	1.00	1.40	1.00	1.00	1.00
Pueblo, Colo.	1.10*	.90*	.....	.....	1.50*	.....
San Diego, Calif.	.80@1.00	.80@1.00	1.30@1.60	1.25@1.55	1.15@1.45	1.10@1.40
San Francisco, Calif.	.....	1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.50*	1.50*	2.00*	1.50*	.....	1.50*
Yutan, Neb.	.40	Bank run .40				

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
Attica, Covington, Silverwood, Ind., and Palestine, Ill.	.....	.75	.75	.75	.75	.75
Boonville, N. Y.	.60@ .80	.....	.55@ .75	.....	.....	1.00
Cape Girardeau, Mo.	River sand, 1.00 per yd.					
Cherokee, Ia.	.80 per ton—1.20 washed					
Dudley, Ky. (Crushed Sand)	.....	1.05	.....	1.00	.....	.....
East Hartford, Conn.	.65 per cu. yd.					
Elkhart Lake, Wis.	Washed gravel .66					
Estelle Springs, Tenn.	.....	.....	.....	.....	.....	.85
Fishers, N. Y.	.50@ .65	.....	.....	.50@ .65	.....	.50
Hamilton, O.	.40 per cu. yd. in pit					
Hartford, Conn.	.....	1.00*	.....	.....	.....	.....
Hersey, Mich.	.....	.....	.....	.50	.....	.....
Indianapolis, Ind.	Mixed gravel for concrete work, .65					
Lindsay, Tex.	1.45	.....	.....	.....	.60	.....
Janesville, Wis.	.....	.65	.....	.....	.65@ .75	.....
Oxford, Mich.	.....	.....	.....	.65	.65	.....
Pine Bluff, Ark.	Road gravel .50					
Rochester, N. Y.	.60@ .75	.60@ .75	.....	.....	.50@ .65	.50@ .65
Roseland, La.	.....	.75	.....	.....	.....	.....
Saginaw, Mich., f. o. b. cars	.....	.75	1.30	1.30	1.30	1.30
St. Louis, Mo.	60% gravel, 40% sand, 1.40					
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Waco, Texas	.....	.80	.....	1.50	.....	1.30
Winona, Minn.	.....	.....	.70	.70	.70	.70
York, Pa.	.....	.95@1.20		(crushed rock sand)		

*Cubic yard. B Bank. L Lake. ‖ Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Buffalo, N. Y.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	4.00	1.00	2.50	1.25	1.15	1.10	1.10
Eastern Pennsylvania and Northern New Jersey	2.00	1.20	1.50	1.20	1.20	1.20	1.20
Easton, Pa.	2.00	.80	1.25	.90	.90	.80	.80
Erie, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.00	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.	All sizes, $1.50, F. O. B. Chicago						
Detroit, Mich.	All sizes, 1.65 F. O. B. Detroit						
Ironton, O.	2.05	Other grades 1.45					
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	1.92	1.67	1.77	1.77	1.77	1.67	1.67
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	(Any delivery in city except team track deliveries) 1.25	1.50	1.25	1.25	1.25	1.25
Steubenville, Lowellville and Canton, O.	2.00	1.35	1.60	1.35	1.35	1.35	1.35
SOUTHERN:							
Birmingham, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton & Low Moor, Roanoke, Va.	2.50	1.00	1.60	1.25	1.25	1.15	1.05

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing Hydrate	Masons' Hydrate	Agricultural Hydrate	Chemical Hydrate	Ground Burnt Lime Blk.	Ground Burnt Lime Bags	Lump Lime Blk.	Lump Lime Bbl.
EASTERN:								
Adams, Mass.			7 00					3.50
Bellefonte, Pa.			8.00	9.00	8.00		7.50	
Berkley, R. I.			12.00					2.30
Buffalo, N. Y.		11.00	11.00	11.00			9.50	2.00•
Chaumont, N. Y.					2.50	4.00		
Lime Ridge, Pa.							5.00	
Paxtang and LeMoyne, Pa.					5.00		4.75@5.00	
Union Bridge, Md.			13.00		5.50			
West Rutland, Vt.	13.50	12.25	7.50@12.25	14.00			11.00	3.50
West Stockbridge, Mass.			15.00					
Williams and Blue Bell, Pa.			11.25					
Williamsport, Pa.			10.00			10.00	6.00	
York, Pa. (dealers' prices)		9.50	9.50@10.50	9.50@10.50			7.00	
CENTRAL:								
Delaware, Ohio	10.50	9.00	8.50	9.50			8.00	1.40
Geneo, Ohio	10.50§							
Gibsonburg, Ohio	10.50§	9.00	8.50		7.25	9.25	8.00	
Huntington, Ind.	10.50	9.00	8.50				8.00	1.70•
Knowles and Valders, Wis.			12.50		5.00	9.00		
Luckey, Ohio	10.50	9.00	8.00					
Marblehead, Ohio		9.00	8.50				8.00	1.50•
Mitchell, Ind.		11.00	11.00	11.00	9.50		8.50	
Sheboygan, Wis.					5.50	8.50		
White Rock, Ohio	10.50				7.25	9.25		
Woodville, O. (dlrs.' price)	10.50a	9.00a	7.25a	10.00a	7.25		8.00	1.50
SOUTHERN:								
El Paso, Tex.							12.50	
Karo, Va.							7.00	1.30
Knoxville, Tenn.		9.00@11.00	5.00@8.00				6.50	1.20
Ocala and Zuber, Fla.	12.00						10.00	1.50
Sherwood, Tenn	11.00	9.50			7.50		7.50	
Staunton, Va.					8.00		9.50b	1.60
WESTERN:								
Colton, Calif.			15.00				19.70	
Kirtland, N. Mex.					12.50	15.00		
San Francisco, Calif.	22.00	22.00	15.00	22.00				2.15*
Tehachapi, Calif.							13.00	2.00

‡100-lb. sacks; *180-lb. net, price per barrel; †180-lb. net, non-returnable metal barrel; §Paper sacks. (a) 50-lb. paper bags; terms, 30 days net; 25c per ton or 5c per bbl. discount for cash in 10 days from date of invoice. (b) Burlap bags. (c) 200-lb. bbl.

Miscellaneous Sands

(Continued from preceding page)

Stone sawing	1.50
Traction	1.00
Brass molding	2.75
Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass Molding	2.15
Dresden, O.—Molding coarse	1.50@1.75
Brass molding	1.75
Dunbar, Pa.—Traction, damp	2.00
Dundee, O.—Glass, core, sand blast, traction	2.50
Molding fine, brass molding (plus 75c for winter loading)	2.00
Molding coarse (plus 75c for winter loading)	1.75
Falls Creek, Pa.—Glass sand	2.50
Furnace lining, traction and molding coarse and fine, and core	2.00
Sand blast	3.50
Eau Claire, Wis.—Core	.75@1.25
Sand blast	3.25@4.25
Traction sand	.50
Franklin, Pa., and Utica, Pa.—Traction	1.75@2.00
Core	1.25@2.00
Molding coarse	2.00
Furnace lining	2.50
Greenville, Ill.—Molding coarse	1.40@1.60
Joliet, Ill.—Milled, dried and screened No. 2 coarse molding sand and open hearth loam and looting clay	.75@1.25
Kansas City, Mo.—Missouri River core	.80
Kasota, Minn.—Molding coarse and fine, stone sawing (pit run)	1.75
Klondike, Pacific and Gray Summit, Mo.—Molding fine and core	1.75@2.00
Mapleton, Pa.—Glass sand, core, furnace lining, molding fine and coarse; dry, 2.50; damp	2.00
Massillon, O.—Traction, molding fine and coarse, furnace lining	2.25
Michigan City, Ind.—Core, traction	.30@ .40
Mineral Ridge, Ohio—Core, furnace lining, molding fine and coarse, roofing, sand blast, stone sawing and traction, brass molding	2.00
Montoursville, Pa.—Core	1.25@1.50
Traction	1.00@1.25
Brass molding	1.25@1.40
New Lexington, O.—Molding fine	2.75
Molding coarse	2.50
Oregon, Ill.—Core, furnace lining, molding fine and coarse, traction	.75
Brass molding	.75
Sand blast	3.00
Ottawa, Ill.—Core, molding coarse (crude silica sand)	.75@1.00
Ottawa, Minn.—Core	1.00@1.50
Glass, molding coarse, stone sawing (all crude silica)	1.00@1.50
Pelzer, S. C.—Glass sand (carload lots only)	.70

Miscellaneous Sands

(Continued)

Rockwood, Mich.—Core, damp	2.50
Roofing	2.75
Sand blast	3.75
Round Top, Md.—Glass sand	1.75@2.00
Core, furnace lining	1.45
Traction	1.60
(All per 2000 lbs.)	
San Francisco, Cal.—Glass and roofing	3.00@3.50
Core, molding fine and brass	2.30@2.60
Furnace lining and molding coarse	3.60@4.25
Coarse core sand	3.60@4.25
Sand blast	3.75
Stone sawing and traction	2.30
Thayers, Pa.—Core	1.50@1.75
Furnace lining	1.00
Molding fine and coarse	1.25
Traction	1.75
Utica, Ill.—Core	.75@1.00
Furnace lining	.75
Molding fine and coarse	.60@ .75
Sand blast	2.50
Stone sawing	1.00@2.50
Traction and brass molding	1.00@1.25
Utica, Pa.—Core	1.25@2.25
Molding fine and coarse, traction, brass molding	2.00
Warwick, O.—Core, furnace lining, molding fine and coarse (damp, 1.75) dry	2.00
Traction (dry)	2.00
Zanesville, Ohio—Brass molding and molding fine	1.50@1.75
Molding coarse	1.25@1.50

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Crude Talc	3.50
Ground talc (20-50 mesh), bags	10.00
Cubes	50.00
Blanks, per lb.	.07
Chatsworth, Ga.—Crude talc	8.00@10.00
Ground talc (150-200 mesh), bags	12.50
Pencils and steel workers' crayons, per gross	1.50@ 2.00
Chester, Vt.—Ground talc (150-200 mesh), including bags	8.50@10.00
Emeryville, N. Y.—150-200 mesh; bags	14.75
Glendale, Calif.—Ground talc (150-200-mesh	16.00@30.00
(Bags extra)	
Ground Talc (50-300 mesh)	13.50@15.50
200 mesh)	13.50@14.50
Hailesboro, N. Y.—Ground talc (150-250 mesh), bags	18.00
Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton	2.75@3.50
Ground talc (20-50 mesh), bags, 7.75; (150-200 mesh) bags	8.00@10.50
Johnson, Vt.—Ground talc (20-50 mesh), bulk 7.50 (150-200 mesh)	8.00@15.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@15.00
(Bags extra)	
Los Angeles, Calif.—Ground talc (200 Mesh)	20.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@13.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.00
(Bags extra)	
Vermont—Ground talc (20-50 mesh); bags	7.50@10.00
Ground talc (150-200 mesh); bags	9.00@16.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk	8.50
(Bags $1.00 extra)	
Ground talc (150-200 mesh), bulk	10.00@15.00
(Bags 1.00 extra)	
Pencils and steel workers' crayons, per gross	1.20@ 2.00

Rock Phosphate

Raw Rock

Per 2240-lb. Ton	
Centerville, Tenn—B.P.L. 72% to 75%	6.00@8.50
B.P.L. 65%	6.00
Gordonsburg, Tenn.—B.P.L. 68%@72%	4.00@5.00
Tennessee—F. o. b. mines, long tons, unground Tenn. brown rock, 72% B. P. L.	7.00
Mt. Pleasant, Tenn.—Analysis, .70 B.P.L. (2000 lbs.)	7.00
Montpelier, Idaho—70% B.P.L.—Crude	4.75
Crushed 2-in. ring and dried	5.00
Paris, Idaho.—2,000 lb. mine run, B.P.L. 70%	4.00
Wales, Tenn.—B.P.L. 70%	7.25@7.75
Per 2000-lb. Ton	
Barton, Fla.—Analysis, 50% to 65% B.P.L.	4.00@6.00

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f.o.b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$ 9.30	$8.40	$8.10	$7.80
24x14	9.30	8.40	8.10	7.80
22x12	10.80	8.70	8.40	9.10
22x11	10.80	8.70	8.40	9.10
20x12	10.80	8.70	8.40	9.10
20x10	11.70	9.00	8.70	8.40
18x10	11.70	9.00	8.70	8.40
18x 9	11.70	9.00	8.70	8.40
16x10	11.70	8.40	8.40	8.10
16x 9	11.70	8.40	8.40	8.10
16x 8	11.70	8.40	8.40	8.10
18x12	11.10	8.70	8.40	8.10
16x12	11.10	8.70	8.40	8.10
14x10	11.10	8.40	8.10	7.80
14x 8	11.10	8.40	8.10	7.80
14x7 to 12x6	9.60	8.40	8.10	.....
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$7.50	$7.20	$5.75
22x11	8.40	7.80	7.50	5.75
Other sizes	8.70	8.10	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.
Granulated slate per net ton f. o. b. quarries, Vermont and New York, 7.50

(Continued from preceding page)

Ground Rock

Centerville, Tenn.—B.P.L. 65%	6.00@6.50
B.P.L. 75% (brown rock)	12.00
Columbia, Tenn.—B.P.L. 68% to 72%	5.50
B.P.L. 65% (90% thru 200 mesh) bulk	5.50
Morriston, Fla.—Analysis, 35% B.P.L.	12.00
Mt. Pleasant, Tenn.—B.P.L. 65@70%	5.00@6.00

Florida Soft Phosphate

Raw Land Pebble

	Per Ton
Bartow and Norwills, Fla.—B.P.L. 50%, bulk	6.00@ 8.00
B.P.L. 78%, bulk	13.50
Florida—F. o. b. mines, long ton, 68/66% B.P.L.	3.00
68% (min.)	3.25
70% (min.)	3.50
Jacksonville (Fla.) District	10.00@12.00

Ground Land Pebble

	Per Ton
Jacksonville (Fla.) District	14.00
Add 2.50 for sacks.	
Lakeland, Fla.—B.P.L. 60%	6.00
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65-70% B.P.L.	6.00@ 7.00

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Chicago, Ill.—Stucco chips, in sacks f.o.b quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	$18.00@20.00	9.00@14.00
Granville, N. Y. — Red slate granules		7.50
Ingomar, Ohio	12.00@25.00	12.00@25.00
Lincoln, Neb. — Red, white, grey, in bags		30.00
Middlebrook, Mo.—Red granite; sacks	30.00@32.50	20.00@25.00
Milwaukee, Wis.		20.00@26.50
Phillipsb'g, N. J.—Green stucco dash		9.00@14.00
Piqua, O.—Marble	8.00@10.00	7.00@ 9.00
Poultney, Vt. — Roofing granules		7.50
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.	7.00@12.00	12.00
Wausau, Wis.	14.00@18.00	.....

Concrete Brick

Prices given per 1,000 brick, f. o. b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	18.00	25.00@35.00
Bellows Falls, Vt.	20.00	25.00
Birmingham, Ala.	13.50	27.50@45.00
Bridgeport Conn.	31.00	12.00
Carpenterville, N. J.	16.00	35.00@65.00
Easton, Pa.	16.00	40.00@60.00
Eugene, Ore.	22.50@25.00	35.00@75.00
Rochester, N. Y.	21.00	.....
Friesland, Wis.	20.00	.....
Houston, Tex.	.....	19.50
Omaha, Nebr.	19.00	28.00@40.00
Piqua, O.	15.00	25.00
Phoenix, Ariz.	16.00	35.00@80.00
Portland, Ore.	21.00	45.00@75.00
Puyallup, Wash.	20.00	35.00@85.00
Rapid City, S. D.	18.00	30.00@45.00
St. Paul, Minn.	15.00	30.00@35.00
Salem, Ore.	25.00@30.00	35.00@75.00
Salt Lake City, Utah.	16.00	35.00@40.00
Seattle, Wash.	18.00@22.00	35.00@75.00
Springfield, Ill.	18.00	24.00@25.00
Tampa, Fla.	15.00	25.00@65.00
Wauwatosa, Wis.	13.00@14.00	30.00@42.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	7.00
Barton, Wis.	8.50
Boston, Mass.	11.50@12.50
Brighton, N. Y.	14.75
Buffalo, N. Y.	16.50
Dayton, Ohio	12.50@13.50
El Paso, Texas	12.00
Gary, Ind.	11.50@12.00
Grand Rapids, Mich.	12.00
Lancaster, N. Y.	12.75
Michigan City, Ind.	10.00
Milwaukee, Wis.	12.00@13.00
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.	15.00
Redfield, Mass.	15.00
Saginaw, Mich.	11.50
San Antonio, Texas—Common	15.00
South Dayton, Ohio	12.50@13.50
Syracuse, N. Y. (delivered at job)	18.00
F. o. b. cars	13.00
Washington, D. C.	13.50
Winnipeg, Can.	14.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton Finishing	Common
Atlanta, Ga.	19.00	16.00
Baltimore, Md.	15.00	13.00
Boston, Mass.	23.00	20.00
Cincinnati, Ohio	19.60	14.50
Chicago, Ill.	18.00	.....
Dallas, Tex.	25.00	.....
Denver, Colo.	30.00	.....
Detroit, Mich.	15.25	13.25
Fort Dodge, Ia.	19.70	17.00
Grand Rapids, Mich.	15.65	.....
Los Angeles, Calif.	30.00	30.00
Minneapolis, Minn.	29.00	22.00
Montreal, Que.	21.00	21.00
New Orleans, La.	.....	17.25
New York, N. Y.	16.99	.....
St. Louis, Mo.	23.20	20.00
San Francisco, Calif.	22.00	18.00
Seattle, Wash.	27.00	.....
	Lump per 180-lb. Barrel (net) Finishing	Common
Atlanta, Ga.	2.00	1.50
Baltimore, Md.	.....	12.00†
Boston, Mass.	3.35	3.10
Cincinnati, Ohio	.....	12.25
Chicago, Ill.	.....	1.40
Denver, Colo.	.....	2.95
Detroit, Mich.	11.50†	10.50†
Los Angeles, Calif.	3.00*	3.00*
Minneapolis, Minn.	1.70	1.40
New Orleans, La.	.....	1.75
New York, N. Y.	.....	3.69*
St. Louis, Mo.	.....	.70*
San Francisco, Calif.	.....	1.90
Seattle, Wash.	3.25	2.75

*280-bbl. (net). †Per ton.

Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags.

Atlanta, Ga. (bags)	3.45
Boston, Mass.	2.61
Cedar Rapids, Ia.	2.21
Cincinnati, Ohio	2.35
Cleveland, Ohio	2.26
Chicago, Ill.	1.97
Dallas, Tex.	2.25
Davenport, Ia.	2.16
Denver, Colo.	2.69
Detroit, Mich.	2.17
Duluth, Minn.	1.94
Indianapolis, Ind.	2.21
Kansas City, Mo.	2.30
Los Angeles, Calif.	3.00@3.20
Milwaukee, Wis.	2.18
Minneapolis, Minn.	2.24
Montreal, Can. (sacks 20c extra)	2.40
New Orleans, La.	2.88
New York, N. Y. (includes bags)	2.35
(10c per bbl. discount in 10 days)	
Pittsburgh, Pa.	2.02
Portland, Ore.	3.05
St. Louis, Mo.	2.10
San Francisco, Calif.	2.63
St. Paul, Minn.	2.24
Toledo, Ohio	2.20
Seattle, Wash.	2.94
F. o. b. Seattle (including sacks)	3.50

NOTE—Add 40c per bbl. for bags.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White‖ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	—Plaster Board— ¼x32x36" Weight 1500 lbs. Per M Sq. Ft.	⅜x32x36" Weight 1850 lbs. Per M Sq. Ft.	Wallboard, ⅜x32 or 48", Lengths 6'-10', 1850 lbs. Per M Sq. Ft.
Alabaster, Mich.	3.00	4.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Blue Rapids, Kan.	3.00	4.00	6.00	8.00	10.00	10.50	10.00	.....	23.75	19.00	19.375	20.00	36.75
Douglas, Ariz.	.....	.....	6.00	13.00	.....	10.50@12.00	.....	.....	.....	11.50@13.50	.....	.....	.....
Eldorado, Okla.	.....	.....	.....	.....	10.00	10.50	10.00	.....	15.00	.....	27.50	29.30	39.55
Fort Dodge, Ia.	3.00	3.50	6.00	8.00	10.00	10.50	15.45@22.00	.....	21.30	20.00	19.375	20.00	30.00
Garbutt, N. Y.	.....	.....	6.00	8.00	10.00	10.00	.....	7.00	.....	.....	.....	20.00	.....
Grand Rapids, Mich.	3.00	4.50	6.00	9.00	10.00	10.00	18.50	.....	27.75	21.00	19.38	20.00	30.00
Gypsum, Ohio	3.00	4.00	6.00	9.00	10.00	10.00	19.25	7.50	27.95	21.00	19.375	20.00	30.00
Hanover, Mont.	4.50	.....	6.00	.....	10.00	10.50	.....	.....	.....	11.00	.....	.....	.....
Loveland, Colo.	3.00	4.00	6.00	8.00	10.00	10.50	.....	.....	29.80	.....	.....	.....	40.00
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00+	30.75	21.00	19.375	20.00	30.00
Piedmont, S. D.	.....	.....	6.00	8.00	10.00	10.50	.....	.....	32.25	.....	27.97	31.04	41.18
Plasterco, Va.	4.00	.....	7.00	8.00	10.00	10.00	20.90	.....	29.90	19.00	21.375	22.00	30.00
Southard, Okla.	3.00	4.00	6.00	8.00	10.00	10.50	10.00	.....	15.00	.....	26.20	28.70	30.00
Winnipeg, Man.	5.50	5.50	7.00	15.00	15.00	15.00	.....	.....	.....	.....	28.50	30.00	35.00

NOTE—Returnable Jute Bags, 15c each, $3.00 per ton; Paper Bags, $1.00 per ton extra.
*Shipment in bulk 25c per ton less; ‡Bond Plaster $1.50 per ton additional; +Sanded Wood Fiber $2.50 per ton additional; §White Moulding 50c per ton additional; ‖Bulk; (a) Includes sacks.

New Machinery and Equipment

New Gasoline Powered Lift Tractor

THE gasoline powered elevating platform truck, known as the Clark Truklift and recently put in production by the Clark Tructractor Co., Buchanan, Mich., conforms in appearance and uses to the electric elevating lift trucks in industrial plants. Its distinguishing characteristics, claim the manufacturers, are ease of maintenance, flexibility, and 24-hr. service.

The loading platform is 26 in. wide and 54 in. long and will elevate 4,000 lb. from 11 to 16 in. in eight seconds; automatic stops provide for both up and down limits; elevation can be stopped by the hand control lever at any point.

Gas powered elevating platform truck

The lifting mechanism is operated by hydraulic pressure. Power is derived by a 15-hp. four-cylinder tractor engine mounted at the rear in a closed compartment. Standard automotive construction has been so adhered to that the Truklift can be serviced by any good automobile or truck mechanic. A hinged hood renders the engine available for quick inspection and the machine can be stripped down to the chassis in less than 20 min.

The driving and elevating controls are mounted on the rear of the engine compartment and are operated by the driver, who drives standing. The brake lever pedal is under the driver's foot, so arranged that the machine stops automatically if the operator steps off while it is running. It is further claimed that it will climb a 10 per cent grade with a 4,000 lb. load and has two speeds in each direction. The total weight is 2500 lb.; over all length 107 in.; width 35½ in. and height 51 in.

Cableway for Handling Material

A CABLEWAY designed for handling material at cars, barges, ground storage, etc., is announced by the Deschanel Engineering Corp., 90 West street, New York City.

The hoist consists of a two-drum reversible unit, with two levers which perform all the operations. A skilled mechanic is not required to run it. The hoisting unit is so constructed that it can be located on the ground while the operator can be stationed at any desired height, with a clear view when unloading or reclaiming from any point. Power is supplied by a continuous electric motor or a gasoline engine, as desired. The bucket is of automatic bridge type clamshell design.

When low head room is wanted, the two-tractor rope type of cableway is used which permits installing of intermediary A-frames carrying the tractor ropes on saddles. In the single-tractor type the cable may be installed horizontally or on an incline, depending on the topography of the ground. With this type the tail tower can be movable in order to cover a large storage area as well as for reclaiming.

A Self-Cleaning Shovel Dipper

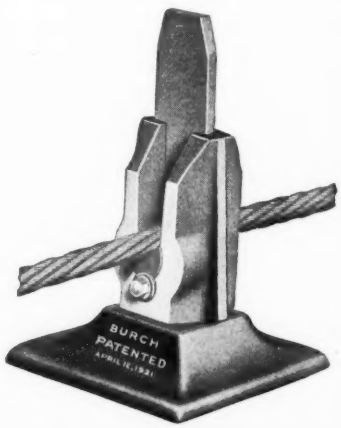
THE Bay City Dredge Works, Bay City, Mich., has placed on the market a dipper which in dumping tips forward, thus insuring, it is said, a clean dump. It is made in capacities of from ½ to 2 cu. yd., and also designed for steam shovels.

Wire Rope Cutter

THE wire rope cutter shown in the illustration and put on the market by the A. Leschen & Sons Rope Co., St. Louis, will, it is claimed, cut wire rope quickly, clearly, cheaply and without involving heavy, expensive equipment.

In this cutter the body and base castings are molded of steel and guaranteed not to break. The cutter blade and lower cutting die are made of high carbon tool steel, properly tempered to insure long life and clean cut ropes, which the splitting chisel cannot insure. The stem of the body casting is made to fit the hardy hole of an anvil as well as its own base plate. The base plate is especially useful in splicing or when a rope is to be cut out on the job, as it eliminates the moving of the heavy anvil.

These dies have two cutting edges, so that when the edge on one side is dulled, it can be reversed. This feature enables each die to give double service. Cuts all grades and sizes of wire hoisting ropes, haulage ropes, running ropes, oil well lines, etc., can be made to 1 in. diameter. No adjusting is necessary for the different sizes of ropes.



Burch wire rope cutter

News of All the Industry

Incorporations

The **Milwaukee Cement Co.**, Milwaukee, Wis., has been incorporated at $50,000 by J. R. Berthelet.

The **Detroit Cut Stone Co.**, has been incorporated in Detroit, Mich., with a capital of $20,000.

The **Quality Stone Co.**, has been incorporated in Tulsa, Okla., with a capital of $25,000, by A. C. Bancroft, W. L. Moody and F. S. Stover.

The **Valley Rock and Gravel Co.**, Brownsville, Tex., has been incorporated with a capital of $10,000 by W. H. Mason, Jr., A. A. Ririe and H. L. Montandon.

The **Ohio Valley Rock Asphalt Co.**, has been incorporated in Summit, Ky., with a capital of $500,000, by R. G. Price, Joseph S. Laurent and Dover Williams, Fountain City, Tenn.

The **Joseph Black Marble Co.**, has been incorporated in Joseph, Ore., with a capital stock of $25,000, by D. W. Warnock, Albert Mount and L. Knapper, and will operate a quarry.

The **Union Springs Gravel Co.**, has been incorporated in Milstead, Ala., with a capital of $25,000, by Henry B. Crawford and M. H. Gardiner, of Columbus, Ga., and others.

The **Phenix Marble Co.**, Phenix, Mo., of which Mastin Simpson, Kansas City, is president and manager, will develop quarry with an output of building stone, floor tile, crushed rock, riprap and fertilizer.

The **Muscle Shoals Rock Asphalt Co.** has been incorporated in Russellville, Ala., with a capital stock of $1,000,000, with C. E. Dexter, Louisville, Ky., as president, has acquired 3000 acres of asphalt rock land.

The **Paducah Sand and Gravel Co.**, has been organized at Evansville, Ind., with a capital stock of $100,000, to produce both sand and gravel. The organizers are W. C. Sanderson, Maxie M. Sanderson, S. H. Hall, Wilbur T. Murphy and D. Gibson Morris.

The **Bond Marble Co.**, which has been incorporated in Knoxville, Tenn., with a capital of $150,000, has organized with H. H. Thrasher, president; C. M. Jones, secretary and treasurer; and will install large derrick, air compressors, air drills, etc., for quarrying marble, and expect a monthly output of 10,000 to 20,000 cubic yards.

Manufacturers

The **Osgood Co.**, manufacturers of excavating machinery at Marion, Ohio, announces that its plants are now working full time, both the day and night shifts.

The **Fuller Engineering Co.**, Allentown, Pa., has closed a contract with the Tennessee Coal, Iron and Railroad Co., for the installation of a complete coal-drying, pulverizing and conveying system at this plant, as well as the burners and feeders for five 834-hp. Stirling boilers designed to operate at 200 per cent of rating The bins will be equipped with automatic indicators which will keep the operator advised as to fuel conditions in the service bins.

Sand and Gravel

Columbus, Neb.—Merger of the sand pits in the vicinity of Columbus under one ownership was effected recently when the Columbus Sand Co., bought the property and business of the Viergutz Sand Co., and the lease on its pit in the Platte river near the Burlington bridge. Manager Curtis says his company will continue operation of all the pits, which will give it a combined average output of about 2,000 cars a year, with a maximum capacity of 6,000 cars.

Danville, Ill.—The Eastern Illinois Gravel Co., of Danville has been incorporated at $100,000. The incorporators are M. A. Neville, of Indianapolis, and W. S. James, H. A. Swallow, S. F. Phillips and R. R. Bookwalter, all of Danville. The purpose of the company is to engage in mining, digging, quarrying and preparing for market sand, stone, gravel and crushed rock and to buy and sell sand, gravel, stone and crushed rock. The company owns 84 acres of land in Massac county among other holdings. The office is located in the First National Bank building.

Quarries

Phoenix, Mo.—The $60,000 power plant being erected by the Phoenix Marble Co., here, will be completed May 1. The plant, besides manufacturing lime products, agriculture, lime and whiting, will furnish light and power for Walnut Grove.

Columbia, Tenn.—Three limestone rock quarries have been opened up near Centerville which are engaged in shipping rock for road materials to the counties of West Tennessee. The quarries are employing about 120 men, and it is expected that when in full operation the output will be not less than 30 car loads per day. It is said that the rock is of an unusually high grade for road material.

Lime

J. E. Shipman & Son, Shamokin, Pa., are erecting a large fertilizer plant to replace the one destroyed by fire recently.

The Wickwire Limestone Co., Gasport, N. Y., is planning to rebuild the portion of its works destroyed by fire recently, with loss estimated at $50,000, including crushing and other machinery.

San Andreas, Calif.—John C. Sciffert has sold his ranch at Kentucky House to Stockton men who are going to operate a limestone quarry. They have thousands of tons of rock and a good place to build a railroad. Work is expected to start at once.

Personal

E. B. Nickols, formerly general superintendent for the National Lime and Stone Co., Carey, Ohio, is now superintendent of the Lake Shore Products Co., Sandusky.

Howard H. Leh, general superintendent of the Phoenix Portland Cement Co., Nazareth, Pa., has been elected a director of the Limestone Products Corp. of America, Newton, N. J.

W. W. Snead, manager of the Birmingham headquarters of the Carolina Portland Cement Co., has been promoted to vice president and manager in charge of the Birmingham territory.

A. J. Earle, formerly of the Kelley Island Lime & Transport Co., and the Ohio Hydrate & Supply Co., Cleveland, is now sales manager for the Independent Brick & Tile Co., Cleveland. Mr. Earle is well known in the sales division of the building supply field in northern Ohio, and under his direction it is the belief of Independent officials that a spurt for Independent brick and tile will be made during 1922. The headquarters of the Independent are in the Arcade, Cleveland, with plants in the southern part of the county.

Obituary

Edward M. Barr, manager of the Chicago office of the Chisholm-Moore Mfg. Co., Cleveland, died suddenly while down town in Chicago on March 15. He had been with the company for 11 years in the Chicago office and had a wide acquaintance among the trade. Mr. Barr was born and raised in Milwaukee and lived there until he went into business about 20 years ago. He was the son of J. M. Barr, formerly assistant to President Earling of the C. M. & St. P. railroad. Mr. Barr leaves a widow and one son.

Knox Taylor, late president of the Taylor-Wharton Iron and Steel Co., High Bridge, N. J., died at his home in High Bridge on April 4. Mr. Taylor was president of the company since 1910 and the fifth generation of his family to manage the industry, founded in 1742. He was vice-president of the **Railway Business Association**; member of the Engineers' Club, Rocky Mountain Club, University Club, Century Association, Railroad Club, Yale-Princeton Club, American Society for Testing Materials, American Institute of Mining and Metallurgical Engineers, American Chemical Society, American Society of Mechanical Engineers, American Museum of Natural History, Society for Promotion of Engineering Education, Princeton Engineering Association, all of New York; Iron and Steel Institute (England); and a member of several other organizations.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912

Of Rock Products, published every other week at 542 S. Dearborn St., Chicago, Illinois, for April 1, 1922.

State of Illinois, County of Cook.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Geo. P. Miller, who, having been duly sworn according to law, deposes and says that he is the manager of the ROCK PRODUCTS and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Tradepress Publishing Corporation, Editor, Clinton S. Darling, Business Managers George P. Miller and Charles A. Breskin, all at 542 S. Dearborn St., Chicago, Ill.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.) W. D. Callender, Wm. B. Mayor, T. J. Sullivan, 9 S. Clinton St., Chicago; Tradepress Publishing Corporation, N. C. Rockwood, C. O. Nelson, A. H. McQuilken, Geo. P. Miller, D. R. Hicks, H. P. Sessions, Forrest O. Poor, all of 542 S. Dearborn St., Chicago, and Chas. H. Fuller, 101 W. 41st St., New York City.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) There are none.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is .....

(This information is required from daily publications only.)

(Signed) GEO. P. MILLER,
Business Manager.

Sworn to and subscribed before me this 28th day of March, 1922.

(Seal) MABEL OLSEN, Notary Public.

(My Commission expires April 12, 1922.)

Form 3526.—Ed. 1916.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion

FOR SALE

1—McMyler 15-20 ton Locomotive Crane, 50-ft. boom.
1—Byers Baby Crane
1—Horizontal Boiler, 100 Hp.
1—Nagle Upright Engine, 20 Hp.
1—8" Marsh Steam Pump.
1—6" Advance Steam Pump.
All in good condition.
Also a lot of sheave and gear wheels, new and used.

The Wabash Sand & Gravel Company
Terre Haute, Ind.

"DREDGING PUMP" FOR SALE

One 10" Morris Sand and Gravel dredging pump, 10" suction, 10" discharge, direct connected to double 9x9 engines.
One Scotch Marine Boiler, 200 H. P.

M. A. CALLAHAN
"The Sand Man"
Schofield Bldg. Cleveland, Ohio

FOR SALE

2000'—16-lb. Track, 30" gauge.
12—1-yd. U Dump Cars, 30" gauge.
5—Turntables.
6—End Dump Quarry Cars.
2—Gable Side Dump Cars.
New and Relay Rails.

IVANHOE EQUIPMENT CO.
1130 Ivanhoe Road Cleveland, Ohio

ROCK DRILLS

Brand new "Wood" Improved Rock Drills.

6—2"
2—2¼"
1—2½"
2—3⅝"

Price about one half regular current prices

Write for complete Stock List

Machinery & Supply Corporation
Joplin, Missouri

LOCOMOTIVE CRANE

15-ton Brown Hoist Locomotive Crane, D. D. D. C., 4-wheel, full revolving 45-ft. boom, $2250.

Jeffrey pulverizer, hammer type, 10-ton per hour capacity.

D. B. Straley, Crown Point, Ind.

FOR SALE

One (1) 7½ Allis-Chalmers Crusher
Good serviceable condition; no repairs required; just replaced with larger one. Make immediate shipment.

Wood County Stone & Construction Co.
Bowling Green, Ohio P. O. Box 114

QUARRY EQUIPMENT

4—20 yd. Steel Underframe Side Dump Cars.
3—16 yd. Steel Underframe Western Dump Cars.
10—1½ yd. Western Dump Cars.
2—10x16 Davenport 36 in. ga. Saddle Tanks.
1—11x16 American 36 in. ga. Saddle Tank.
1—9x14 Porter 4 ft. 8½ in. ga. Saddle Tank.
1—⅝ yd. Thew "O" Traction Shovel.

Walter A. Zelnicker Supply Co., St. Louis

FOR SALE

Roll Hammer Crusher No. 20; manufactured by Kennedy Van Saun, equipped with two sets of grid screens in perfect order. New shaft, spiders, hammers and grids put in this month.

Kapailo Mfg. Co., Inc., 103 Park Ave., New York City

FOR SALE

1—No. 5 Austin Crusher, Direct Drive.
1—Three-Roll Bradley Pulverizer.
1—Three-yard Dirt Dipper, with reversible manganese points for 70 or 70C Bucyrus Shovel.

This equipment is in A-1 operating condition and should be sold direct to users.

Box 1534, Care of Rock Products
542 S. Dearborn St. Chicago, Ill.

WANTED

Two 10- or 12-ton Shay Locomotives for 2-ft. gauge; also Industrial Railway Equipment for highway construction, Lakewood Type with batch boxes. Give full particulars. Address

Box 1552, Care of Rock Products
542 So. Dearborn St. Chicago, Ill.

Advertise your wants in these columns for quick results

Have you a plant for sale?

Do you wish to purchase a plant?

Are you in need of a superintendent or manager?

Are you looking for a position as plant superintendent or manager?

Business Opportunities

FELDSPAR

I wish to dispose of my entire FELDSPAR interests in four companies, three going, shipping crude and ground spar, one in development. Also one mine under lease, from which spar is being ground and shipped daily.

For one wishing to remove to this wonderful "Land of the Sky," this offers an unparalleled opportunity to come into an immediately paying business.

Ill health prevents my giving it the required attention. Business references exchanged. For full information, address

DR. O. L. SUGGETT
128 Woodrow Ave. Asheville, N. C.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid for in advance of insertion.

RETURN TUBULAR LOCOMOTIVE BOILERS WATER TUBE SCOTCH MARINE

A LARGE STOCK OF HIGH-GRADE BOILERS OF PRACTICALLY ALL SIZES, TYPES AND MAKES, TAKEN OVER FROM DU PONT CHEMICAL COMPANY'S AND OTHER PLANTS WITH PRODUCTION RECORDS—RECONDITIONED, OFFERED SUBJECT TO ANY INSPECTION, AVAILABLE *NOW!*

"SAVE TIME AND MONEY ON YOUR POWER INSTALLATION— LET DAVIS FURNISH THE BOILERS"

LONG DISTANCE TELEPHONE RANDOLPH 2232

J. F. DAVIS

1122-1123-1124 Harris Trust Building CHICAGO, ILL.

FOR SALE

1—42-ton Standard gauge Baldwin Mogul, 160-lb. Steam.
1—36-ton Standard gauge Baldwin Mogul, 11' wheel base.
2—50-ton Standard gauge Brooks 6-wheel switchers, 160-lb. steam..
1—50-ton Standard gauge Shay geared locomotive.
1—42-ton Standard gauge Shay geared locomotive.
2—23-ton brand new 36" gauge Porter 6-wheel switchers, separate tenders.
2—18-ton O & S 8-wheel two-line locomotive cranes.
1—14-B Bucyrus Steam Shovel, mounted on traction wheels.

Birmingham Rail & Locomotive Co.
Birmingham, Ala.

IMMEDIATE DELIVERY

Send Us Your Steam Shovel Inquiries

No. 18K GATES CRUSHER.
30—75-Hp. Single Drum Hoists, 25 Cy. Motors
25—40-50-Hp. D. D. Hoists, 60 Cy.
Nos. 3-5-6-7½ and 8K CRUSHERS.
6- and 12-Ton Gasoline Locomotives.
10x12-in. Steam Hoist, 3 Drum with Boiler.
60-Hp. Locomotive Type Boiler.
150-Hp. Boiler, Buttstrap with Stoker, 156 lbs.
100-TON 2½-YD. ELEC. SHOVEL.
50 to 5000 ft. Steam, Belt & Elec. Comp's.
JAW AND ROLL CRUSHERS.
10—15- and 20-Ton Locomotive Cranes.
Large amount Contractors' Equip., Towers, Derricks, etc.

Send us your inquiries for Steam Engines, Centrifugal Pumps, Quarry Equip., etc.

ROSS POWER EQUIP. CO.
Indianapolis, Ind.

FOR SALE

One 18" Bonnot Mill; one 24" Symons disc crusher; one No. 6 Austin screen, complete with screen sections. Above items are priced for quick sale. Our reason for selling, enlarging plant.

JOHN D. OWENS & SON CO.
Owens, Marion County, Ohio

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25', 3½ x25', 4x30', 5½x50', 6x50' and 7x60'; double shell dryers, 4x20', 5x30' and 6x35'; steam-heated air rotary dryers, 4x30' and 6x30'.

KILNS—Rotary kilns, 3½x25', 5x60' and 6x70', 6x100', 7x80' and 8x110'.

MILLS—6x8', 6x5', 5x4', 3x3½' pebble and ball mills; 8x4', 6x4' and 4x4' continuous ball mills; 3' March mill; 42", 33" and 24" Fuller-Lehigh mills; 4½x20', 5x11', 5x20', 5½x22' and 6x20' tube mills; 7½x13", 9x15", 16x10" and 12x26" jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 24", 36" and 40" cage mills; 3' and 4½', 6' and 8' Hardinge mills; 18x12", 20x12" and 30x10" roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 sturtevant ring roll crusher; 3 roll and 2 roll and No. 000, No. 00 and No. 0 Raymond mills; one No. 5 Telsmith breaker; one 36" Sturtevant emery mill; one 3 roll Griffin mill; 60" chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; 6x8', 6x5' and 4x3' Newaygo vibrating screens; hummer screens; Richardson automatic scales; 8' and 10' Emerick air separators.

Air compressors and tanks.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

FOR RENT AND FOR SALE

10—6-yd. rebuilt dump cars, std. gauge.
20—12-yd. Westerns, like new, std. gauge.
50—60,000-lb. capacity flat and box cars.
1—Western standard gauge spreader.
1—Osgood 18 revolving shovel, traction wheels. No. 794, ¾-yd. bucket, used 8 months.
1—Class 14 Bucyrus dragline on caterpillars, 70-ft. boom, 2-yd. bucket, used 6 months.
1—Marion 76 steam shovel, No. 3503, std. gauge.
1—No. 2 Brownhoist, 4-wheel gasoline crane, std. gauge, 40-ft. boom, ½-yd. bucket, new 1921.
64—40-ft. NEW 80-lb. 18-in. I beams, not drilled.
1—NEW Lakewood concrete chuting system.
6—NEW wood-burning locomotive stacks.

LOCOMOTIVES

1—50-ton 18x24-in. six-wheel switcher.
1—40-ton 17x24-in. four-wheel switcher.
2—NEW 24-ton six-wheel Porters, separate tender, 36-in. gauge.
2—18, 14, and 10-ton Vulcans, 36-in. gauge.

INDUSTRIAL EQUIPMENT CO.
McCormick Building Chicago, Ill.

WANTED

To purchase 7½ C Symons Gyratory Crusher. Frame must be solid and not unduly worn. Address with full description, shop number, etc., together with price and general condition to

KEYSTONE COAL CO.
114 N. George St. York, Pa.

SECOND-HAND EQUIPMENT

No. 7½ Kennedy gyratory crusher.
No. 5 Gates gyratory crusher.
9x18 jaw crusher.
50-ft. bucket elevator and 3x16 revolving screen.
Keystone Excavator (ditcher and skimmer scoops).
65-ton Bucyrus shovel 2½ on railroad trucks.
Thew full revolving traction shovel, ⅝ yd.
Byers auto crane, 32 ft. steel boom, ¾ yd. bucket.
⅝-yd. caterpillar drag line, 40-ft. boom.
15-ton full revolving locomotive crane.
Switcher, 6-wheel.
½-yd. Pioneer cableway bucket with hanger.
15 cu. ft. Hayward orange peel bucket.
Sturdevant rolls, 20x14 with feeder.
Holt tractor and Port Huron trailers.
2 miles 24" gauge portable track, 24" gauge.
30 steel cars, 24" gauge, 1½ yd.
2 locomotives, gasoline, 3-ton, 24" gauge.
Bargain prices. Can give terms.
LOCK BOX 205, CROWN POINT, INDIANA.

New—RAILS—Relaying

All sections on hand for quick shipment. Reasonable prices quoted. Our stock is very complete.

M. K. FRANK
Frick Building Pittsburgh, Pa.

FOR SALE

No. 7 Smidth Ball Mill Parts: 10—Manganese Steel Grinding Plates. Other miscellaneous parts, including head, plates, screens, etc.

No. 7 Gates Ball Mill Parts: 10—Manganese Steel Grinding Plates. Other miscellaneous material, such as plates, screens, etc.

This material is all brand new. For price and particulars, address

PHOENIX PORTLAND CEMENT CO.
Nazareth, Penna.

WANT TO BUY

About 40 Sand-Lime Brick Cars, 28" gauge, also Saginaw or Kommick Rotary Sand-Lime Brick Press. Must be in good condition.

The Crume Brick Company
Dayton, Ohio

Classified Advertising

HAVE YOU ANY PROBLEMS

relating to the location of quarry properties; appraisals for valuation; cost installation; production control; executive control, etc.?

Consulting industrial engineer specializing in these problems pertaining to the rock products industry, is open for a few more engagements.

A strictly personal service to operators who desire to make larger profits. Address

Box 1547, Care of Rock Products
542 S. Dearborn St. Chicago, Ill.

WANTED

POSITION AS SUPERINTENDENT

of quarry or crushing plant, by experienced operator. Would consider making an investment with live concern. Address

Box 1561, Care Rock Products
542 South Dearborn Street, Chicago, Ill.

POSITION WANTED

First Class Lime Plant Superintendent, who has a life experience in burning and hydrating lime, is open for a position as superintendent or assistant superintendent of a lime plant and quarry.
Can produce first class references as to character and ability. Address

Box 1558, Care of Rock Products
542 S. Dearborn St. Chicago, Ill.

WANTED

Competent man to superintend large sand and gravel plant with output of three thousand tons daily. Must have experience in crushing, washing, conveying machinery and handling men. Desirable location near Philadelphia. Permanent position for right man. State references, salary and experience. Quick reply. Address

Box No. 1560, Care of Rock Products
542 S. Dearborn St. Chicago, Ill.

BURNERS WANTED

For cement burning. Must be familiar with oil burning. Write

Monolith Portland Cement Company
Monolith, Calif.

SUPERINTENDENT WANTED

with some capital to take charge of a quarry located two miles from a large city, on a paved road; also railroad connections. Address

Box 1557, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

WANTED

Experienced mill foreman for Portland cement plant in Kansas district. Address

Box 1554, Care Rock Products
542 So. Dearborn St., Chicago, Ill.

POSITION WANTED

Having disposed of my interests in the Sand and Gravel Business am now open for something in the same line; have had eight years' experience; have had the entire management of our company, and am capable of taking entire charge of, or will take any position with chance for advancement. I know what it takes to make a gravel plant go and pay dividends, and I believe I can satisfy anyone needing a competent man to share some of the burden that goes with the business, and would be pleased to hear from anyone needing help. Have had experience with pumps, belt conveyors, cableways, drags, and industrial machinery; also the different kinds of screening plants. Address

Box 1559, Care Rock Products
542 South Dearborn Street, Chicago, Ill.

WANTED

Modern gypsum mill with America's purest gypsum deposit wants expert plaster kettle man with references, with or without investment. Address

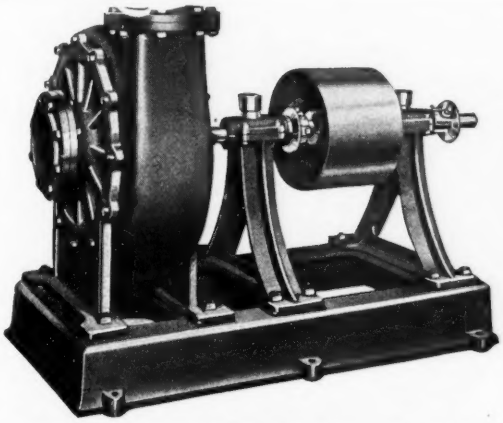
G. E. ELLSWORTH
Kearns Building Salt Lake City, Utah

WANTED

Position in Southeastern States, Mexico or South America as operator or executive of cement plant, large quarry or crushing plant. Qualified for general manager or general superintendent. Over fifteen years' experience in the operation of cement plants and construction of same, quarry work, explosives and crushing plants. Address

Box 1556, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

When writing advertisers please mention ROCK PRODUCTS



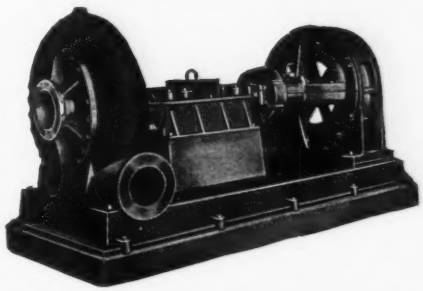
The LIGHTNING Sand Gravel and Dredging Pump

The durability and integrity of Lightning Sand Pumps, stamp them as the ideal pump for sand companies and contractors.

They are easy to operate, easy to adjust, and easy to replace parts. Shell and Runner made of Semi-steel.

Write for prices and complete information

Kansas City Hay Press & Tractor Co.
Kansas City, Mo.



Heavy Service Dredging Pump

Where conditions are too severe for our standard sand pump, the above type is recommended.

It is built in sizes from 4" up, arranged for belt, motor, or engine drive.

MORRIS MACHINE WORKS
Baldwinsville, N. Y.

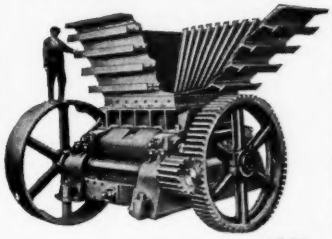
39 Cortlandt St., New York City
Real Estate Trust Bldg., Philadelphia, Pa.
217 N. Jefferson St., Chicago, Ill.

Bulletin No. 19-B fully describes our complete line of sand and dredging pumps. Have you your copy?

MORRIS

Since the Civil War Builders of Centrifugal Pumps, Hydraulic Dredges, and Steam Engines

"PENNSYLVANIA" Single Roll Crusher



The New Series of "Pennsylvania" Single Roll Crushers take steam-shovel feed of limestone, cement rock, gypsum and similar materials, — wet and sticky, — without feeder, and make maximum reduction in one operation. All parts readily accessible. Maintenance cost lower per ton than for any other type. Massive construction — Reliable Safety Devices — Convenient adjustment. Capacities 5 to 450 tons hourly.

Put Your Reduction Problems Up to Us

PENNSYLVANIA CRUSHER COMPANY

New York
Pittsburgh

Stephen Girard Bldg., Philadelphia

SAUERMAN DRAGLINE CABLEWAY EXCAVATORS

dig, convey, elevate and dump in one operation

Cost data furnished by prominent gravel producers who are using Sauerman equipment backs up our claim that sand and gravel can be excavated and conveyed from pit to plant by one of our drag-line cableway excavators at a lower cost per ton than by using any other equipment or combination of equipment.

Write for Catalog No. 7

Sauerman Bros.
1140 Monadnock Bldg.
Chicago

Also Mfrs. of Power Scrapers

"NEW HOLLAND" ROCK CRUSHERS

Highest in quality
Low in price

Guaranteed to crush all kinds of rock for road and concrete work, ores, coal, cinders, etc.

Write for full particulars

New Holland Machine Company

100 Franklin Street

New Holland, Pa., U. S. A.

RELEASE THAT STEAM SHOVEL

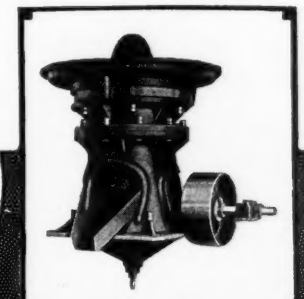
for other work and load your trucks with a

Robins Portable Conveyor

It will cut your handling costs to a minimum. SAVINGS AS HIGH AS 75% CAN BE EFFECTED. Write for bulletin.

ROBINS CONVEYING BELT COMPANY

New York Chicago Pittsburgh Boston



Austin Gyratory Crushers

Stationary and Portable Types

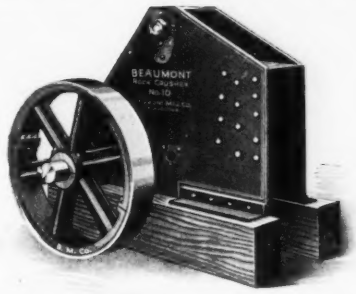
are fully illustrated and described in Catalog 29-T just off the press. If you are interested in crushers, send for the catalog for it explains in detail the reasons for the remarkable records made by the Austin. These records of low operating costs, high production figures and all around efficiency are a result of the many exclusive Austin features.

The catalog also illustrates and describes elevators, screens, bins, cars, etc., and contains layouts of many particularly successful crushing plants. Your file will not be complete without it.

Austin Manufacturing Co.

New York CHICAGO San Francisco

BEAUMONT ROCK CRUSHERS



Built for great strength where hard crushing, portability and efficiency are required

Size	Jaw Opening	Tons Per Hour	H.P. Required	Weight
9	9″x15″	12-18	15	8,500
10	10″x20″	16-24	18	12,300
12	12″x26″	25-35	25	19,900

Immediate Shipment can be made on above size Crushers.

Beaumont Screens
Beaumont Elevators

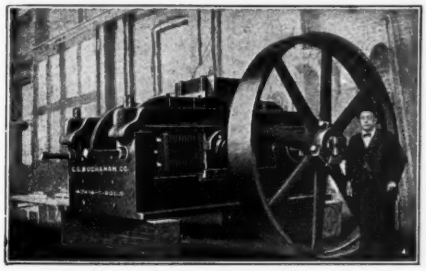
Send for prices and full information on our equipment.

Manufactured by

H. J. KALTENTHALER

236 Cherry Street Philadelphia, Pa.

BUCHANAN CRUSHING ROLLS



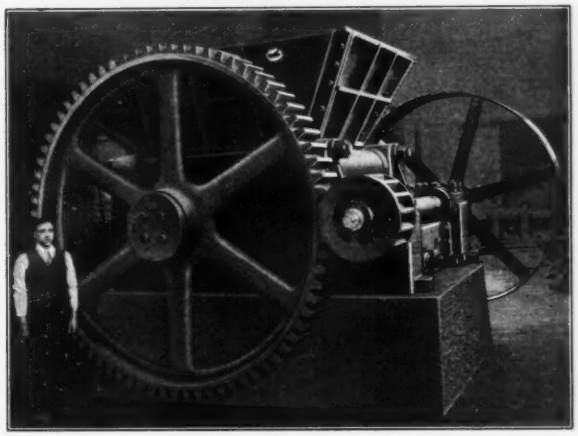
Type "C" Buchanan Box Bed Crushing Rolls for Heavy Duty Bulletin No. 13

Years of manufacturing experience, combined with an intimate knowledge of the conditions under which such machines operate, assures the purchaser of Buchanan Equipment machines of remarkable durability.

COMPLETE CRUSHING PLANTS

C. G. BUCHANAN CO., Inc.

Cedar and West Streets NEW YORK CITY



If you had seen the McLanahan Single Roll Crusher before ordering your first Gyratory or Jaw Crusher, you would now be running only the McLanahan Crushers.

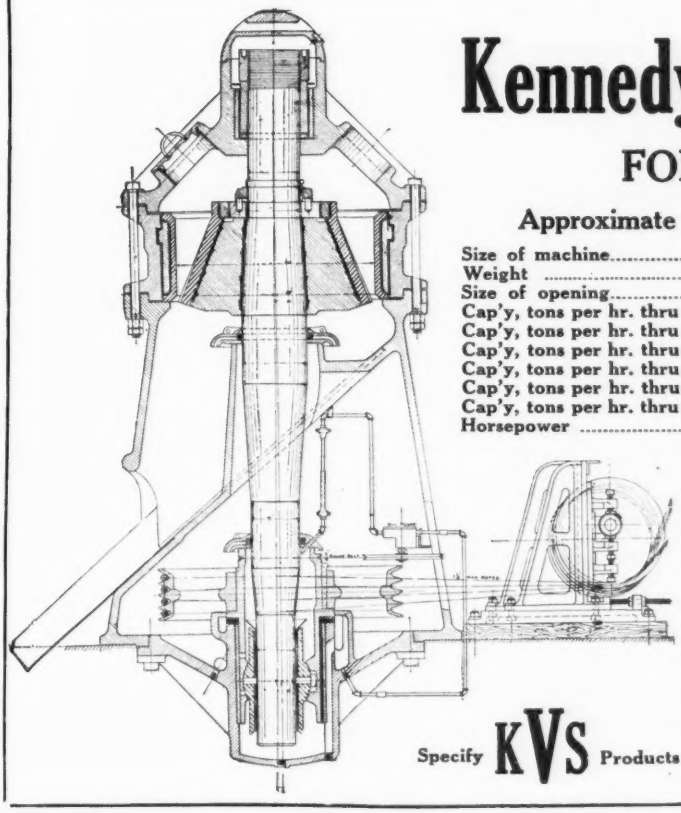
After many years' practical experience building and operating other crushers, we brought out the first Single Roll Crusher, proved it best, simplest and most economical—making least fines—requires but little head room—no apron or hand feeding—takes wet or slimy material.

Capacity, 5 to 500 Tons Per Hour

McLanahan-Stone Machine Co.

Hollidaysburg, Pa.

Screens, Elevators, Conveyors, Rock Washers, Etc.



Kennedy Gearless Crusher

FOR FINE CRUSHING

Approximate Dimensions, Capacity and Horsepower

Size of machine	No. 25	No. 37	No. 49
Weight	15,000 lbs.	30,000 lbs.	70,000 lbs.
Size of opening	5½″	7″	12½″
Cap'y, tons per hr. thru ½″ ring	12 to 20	.....	.....
Cap'y, tons per hr. thru ¾″ ring	18 to 25	25 to 40	.....
Cap'y, tons per hr. thru 1 ″ ring	20 to 30	30 to 45	50 to 70
Cap'y, tons per hr. thru 1½″ ring	25 to 35	45 to 70	65 to 100
Cap'y, tons per hr. thru 2 ″ ring	.....	50 to 100	80 to 125
Cap'y, tons per hr. thru 2½″ ring	.....	.....	100 to 150
Horsepower	15 to 20	20 to 30	40 to 60

We carry these machines in stock for prompt shipment and guarantee capacities.

They may be driven by belt or rope by use of our patented universal guides.

They can be set in any position.

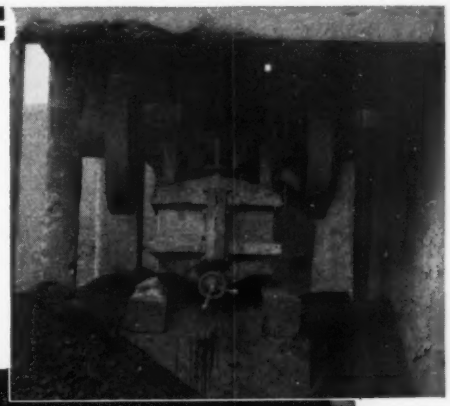
If interested, write or wire our expense for full particulars. If necessary, our engineer will call and show how to install same. One concern is getting more fine stone from a No. 37 than they did from 4 No. 5 Geared Crushers.

Kennedy Van Saun Mfg. & Eng. Corp.
120 Broadway, New York
40, Rue des Mathurins, Paris

Specify KVS Products

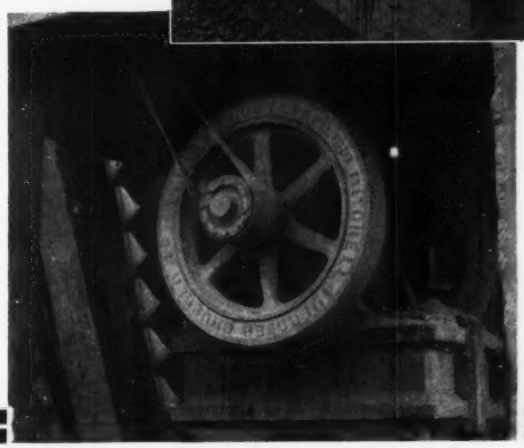
The UNIVERSAL

Crushing Clinker at Gilmore City



The durability of the Universal Crusher is being demonstrated every day at the Gilmore City Portland Cement Corporation.

This 15x24 crusher has been in use since the day this plant started operations, and its day in and day out service during all the past years has been a remarkable achievement, an achievement that makes the Universal the biggest money value in the Crusher world.



Universal Crusher Co.
225 Third Street, Cedar Rapids, Iowa, U.S.A.

Buyers' Directory
of the Rock Products Industry
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AERIAL TRAMWAYS
Interstate Equip. Co., New York, N. Y.

AUTOMATIC WEIGHERS
Schaffer Eng. & Equipment Co., Pittsburgh, Pa.

BAGS AND BAG MACHINERY
Bates Valve Bag Co., Chicago, Ill.
Jaite Co., The, Jaite, Ohio.
Valve Bag Co. of America, Toledo, Ohio.

BARRELS—Lime
Draper Mfg. Co., The, Cleveland, Ohio.
International Cooperage Co., Niagara Falls, N. Y.
Sandusky Cooperage & Lbr. Co., Toledo, Ohio.

BELTING
New York Belting & Packing Co., New York, N. Y.

BINS
Brown Hoisting Machinery Co., Cleveland, O.
Neff & Fry, Camden, Ohio (concrete stone)
Weller Mfg. Co., Chicago, Ill. (storage)

BIN GATES
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Bacon, Earle C., Inc., New York City.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Link-Belt Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Weller Mfg. Co., Chicago, Ill.

BLASTING SUPPLIES
Atlas Powder Co., Wilmington, Del.
Du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.
Hercules Powder Co., Wilmington, Del.

BOILERS, WASTE, HEAT
Edge Moor Iron Co., Edge Moor, Del.
Freeman Mfg. Co., Racine, Wis.

BRICK MACHINERY
Besser Sales Co., Chicago, Ill.
Shope Brick Co., Portland, Ore.

BUCKETS—Elevator
Brown Hoisting Machinery Co., Cleveland, O.
Haiss Mfg. Co., Inc., Geo., N. Y. City, N. Y.
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., Columbus, O.
Orton & Steinbrenner, Chicago, Ill.

BUCKETS
Blaw-Knox Co., Pittsburgh, Pa.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Browning Co., Cleveland, Ohio.
Haiss Mfg. Co., Inc., Geo., N. Y. City, N. Y.
McMyler Interstate Co., Cleveland, Ohio.
Owen Bucket Co., Cleveland, Ohio.
Williams Co., G. H., Erie, Pa.

CABLEWAYS
Blaw-Knox Co., Pittsburgh, Pa.
S. Flory Mfg. Co., Bangor, Pa.
Interstate Equip. Co., New York, N. Y.

CALCINING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio.
Butterworth & Lowe, Grand Rapids, Mich.
Ehrsam & Sons Co., J. B., Enterprise, Kans.

CARS—Quarry and Industrial
Atlas Car & Mfg. Co., Cleveland, Ohio.
Easton Car & Constr. Co., Easton, Pa.
Gehret Bros., Bridgeport, Pa.
Kilbourne & Jacobs Mfg. Co., Columbus, O.
Watt Mining Car Wheel Co., Barnesville, Ohio.
Western Wheeled Scraper Co., Aurora, Ill.

CAR PULLERS
Weller Mfg. Co., Chicago, Ill.

CASTINGS—Alloy, Steel and Malleable Iron
Inland Engineering Co., Chicago, Ill.

CEMENT MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Kennedy-Van Saun Mfg. & Eng. Corp., N. Y. City.

CEMENT MILL REPAIRS
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

CHAINS—Malleable (All Types)
Inland Engineering Co., Chicago.

COMPRESSORS, AIR
Ingersoll-Rand Co., N. Y. City.

CONVEYORS AND ELEVATORS
Caldwell, H. W., & Son Co., Chicago, Ill.
Haiss Mfg. Co., Inc., Geo., N. Y. City, N. Y.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City.
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Robins Conveying Belt Co., New York City.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Sturtevant Mill Co., Boston, Mass.
Universal Road Mach. Co., Kingston, N. Y.

COOLERS
The Reeves Bros. Co., Alliance, O.

CRANES—Locomotive Gantry
Ball Engine Co., Erie, Pa.
Brown Hoisting Machinery Co., The, Cleveland, Ohio.
Byers Mach. Co., The, Ravenna, Ohio.
Erie Steam Shovel Co., Erie, Pa.
McMyler-Interstate Co., Cleveland, Ohio.
Ohio Locomotive Crane Co., Bucyrus, Ohio.
Orton & Steinbrenner, Chicago, Ill.
Osgood Co., The, Marion, Ohio.

CRUSHERS AND PULVERIZERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulverizer Co., St. Louis, Mo.
Austin Mfg. Co., Chicago, Ill.
Bacon, Earle C., Inc., New York, N. Y.
Buchanan Co., Inc., C. G., New York, N. Y.
Butterworth & Lowe, Grand Rapids, Mich.
Chalmers & Williams, Chicago Heights, Ill.
Fuller-Lehigh Co., Fullerton, Pa.
Good Roads Machinery Co., Kennett Square, Pa.
Gruendler Pat. Crusher Co., St. Louis, Mo.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Kaltenthaler, H. J., Philadelphia, Pa.
K. B. Pulverizer Co., New York, N. Y.
Kennedy-Van Saun Mfg. & Eng. Corp., New York, N. Y.
Kent Mill Co., Brooklyn, N. Y.
Lewistown Fdry. & Mach. Co., Lewistown, Pa.
McLanahan-Stone Mach. Co., Hollidaysburg, Pa.
Munson Mill Machinery Co., Utica, N. Y.
New Holland Machine Co., New Holland, Pa.
Pennsylvania Crusher Co., Philadelphia, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Smidth & Co., F. L., New York, N. Y.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Universal Crusher Co., Cedar Rapids, Iowa.
Universal Road Mach. Co., Kingston, N. Y.
Williams Pat. Crush. & Pulv. Co., Chicago, Ill.

CRUSHER REPAIRS—Manganese Steel
American Manganese Steel Co., Chicago Heights, Ill.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

CLUTCHES
Weller Mfg. Co., Chicago, Ill.

DERRICKS
Terry Mfg. Co., New York, N. Y.

DIPPER TEETH
American Manganese Steel Co., Chicago Heights, Ill.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

DREDGING MACHINERY
S. Flory Mfg. Co., Bangor, Pa.

DRILLS
The Loomis Machine Co., Tiffin, Ohio.
Sanderson Cyclone Drill Co., Orrville, Ohio.
Wood Drill Works, Paterson, N. J.

DRILLERS
Pennsylvania Drilling Co., Pittsburgh, Pa.

DRYERS
American Process Co., New York City.
The Reeves Bros. Co., Alliance, O.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

DUST COLLECTING SYSTEMS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

DYNAMITE
Atlas Powder Co., Wilmington, Del.
Du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.
Hercules Powder Co., Wilmington, Del.

ENGINES—Steam
Morris Mach. Works, Baldwinsville, N. Y.

ENGINEERS
Arnold & Weigel, Woodville, Ohio.
Artingstall, S. G., Jr., Chicago, Ill.
Austin Co., The, Cleveland, Ohio.
Bacon, Earle C., Inc., New York, N. Y.
Buckbee Co., J. C., Chicago, Ill.
Ehrsam & Sons Co., J. B., Enterprise, Kans.
Federal Bridge & Structural Steel Co., Waukesha, Wis.
Fuller Engineering Co., Allentown, Pa.
James N. Hatch, Chicago, Ill.
R. W. Hunt & Co., Chicago, Ill.
Randolph-Perkins Co., Chicago, Ill.
Smidth & Co., F. L., New York, N. Y.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Webster Mfg. Co., Chicago, Ill.

EXCAVATORS
Ball Engine Co., Erie, Pa.
Brown Hoisting Machinery Co., Cleveland, O.
Erie Steam Shovel Co., Erie, Pa.
Owen Bucket Co., Cleveland, Ohio.

EXCAVATORS—Dragline Cableway
Link-Belt Co., Chicago, Ill.
Sauerman Bros., Chicago, Ill.

EXPLOSIVES
Atlas Powder Co., Wilmington, Del.
Du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.
Hercules Powder Co., Wilmington, Del.

FUSES
Ensign-Bickford Co., Simsbury, Conn.

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GAS PRODUCERS
Morgan Construction Co., Worcester, Mass.

GEARS
Caldwell, H. W., & Son Co., Chicago, Ill.
Plamondon Mfg. Co., Chicago, Ill.

GLASS SAND EQUIPMENT
Lewistown Fdy. & Mach. Co., Lewistown, Pa.

GRATES
The Kramer Bros. Fdy. Co., Dayton, Ohio.

GRINDING MILLS
Munson Mill Machinery Co., Utica, N. Y.

HOISTS
Flory Mfg. Co., S., Bangor, Pa.
Thomas Elevator Co., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

HOSE—Water, Steam, Air Drill, Pneumatic Tool
Cincinnati Rubber Mfg. Co., Cincinnati, Ohio.
Ingersoll-Rand Co., New York City.
N. Y. Belting & Packing Co., New York, N. Y.

HYDRATING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio.
Kritzer Co., The, Chicago, Ill.
Miscampbell, H., Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Toepfer & Sons Co., W., Milwaukee, Wis.

HYDRAULIC DREDGES
Morris Machine Works, Baldwinsville, N. Y.

LIME HANDLING EQUIPMENT
Weller Mfg. Co., Chicago, Ill.

LIME KILNS
Arnold & Wiegel, Woodville, Ohio.
Glamorgan Pipe & Fdy. Co., Lynchburg, Va.
The Reeves Bros. Co., Alliance, O.
Vulcan Iron Works, Wilkes-Barre, Pa.

LOADERS AND UNLOADERS
Ball Engine Co., Erie, Pa.
Brown Hoisting Machinery Co., Cleveland, O.
Erie Steam Shovel Co., Erie, Pa.
Haiss Mfg. Co., The Geo., New York City.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Orton & Steinbrenner, Chicago, Ill.

LOCOMOTIVES
Baldwin Locomotive Works, The, Philadelphia, Pa.
Brookville Truck & Tractor Co., Brookville, Pa.
Fate-Root-Heath Co., Plymouth, Ohio.
Hadfield-Penfield Steel Co., Bucyrus, Ohio.
Heisler Locomotive Co., Erie, Pa.
Industrial Equip. Co., Minster, Ohio.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Lima Locomotive Works, New York, N. Y.
Porter Co., H. K., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Whitcomb Co., Geo. D., Rochelle, Ill.

MOTOR TRUCKS
Packard Motor Car Co., Detroit, Mich.
Pierce-Arrow Motor Car Co., Buffalo, N. Y.
Traylor Eng. & Mfg. Co., Allentown, Pa.

PACKING—Sheet, Piston, Superheat, Hydraulic
Cincinnati Rubber & Mfg. Co., Cincinnati, Ohio.
N. Y. Belting & Packing Co., New York, N. Y.

PAINT AND COATINGS
Williams, C. K., & Co., Easton, Pa.

PERFORATED METALS
Chicago Perforating Co., Chicago, Ill.
Cross Eng. Co., Carbondale, Pa.
Hendrick Mfg. Co., Carbondale, Pa.

PIPE JOINTS
Berry Flexible Pipe Joint Co., Philadelphia, Pa.

PLASTER MACHINERY
Butterworth & Lowe, Grand Rapids, Mich.
Ehrsam & Sons Co., J. B., Enterprise, Kans.

PORTABLE CONVEYORS
Haiss Mfg. Co., Inc., Geo., N. Y. City, N. Y.

POWDER
Atlas Powder Co., Wilmington, Del.
Du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.
Hercules Powder Co., Wilmington, Del.

POWER TRANSMITTING MACHINERY
Caldwell, H. W., & Son Co., Chicago, Ill.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Manganese Steel Co., Chicago Heights, Ill.
K. C. Hay Press & Tractor Co., Kansas City, Mo.
Morris Machine Works, Baldwinsville, N. Y.
Traylor Eng. & Mfg. Co., Allentown, Pa.

PULLEYS
Weller Mfg. Co., Chicago, Ill.

PULVERIZED FUEL EQUIPMENT
Fuller-Lehigh Co., Fullerton, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.

PUMP VALVES
N. Y. Belting & Packing Co., New York, N. Y.

QUARRY EQUIPMENT
Good Roads Mach. Co., Kennett Square, Pa.
Universal Road Mach. Co., Kingston, N. Y.

ROPE, WIRE
American Steel & Wire Co., Chicago, Ill.
Leschen, A., & Sons Co., St. Louis, Mo.

SAFETY DEVICES—Goggles, Respirators, Etc.
Pulmosan Safety Equipment Co., Brooklyn, N. Y.

SCRAPERS, DRAG
Green, L. P., Chicago, Ill.
Sauerman Bros., Chicago, Ill.

SCREENS
Chicago Perf. Co., Chicago, Ill.
Cross Eng. Co., Carbondale, Pa.
Good Roads Machinery Co., Kennett Square, Pa.
Haiss Mfg. Co., Inc., Geo., N. Y. City, N. Y.
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Co., Chicago, Ill.
Simplex Screen Co., Salt Lake City, Utah.
Smith Eng. Works, Milwaukee, Wis.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Stimpson Equip. Co., Salt Lake City, Utah.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Tyler Co., The, W. S., Cleveland, Ohio.
Universal Road Mach. Co., Kingston, N. Y.
Weller Mfg. Co., Chicago, Ill.

SEPARATORS
Rubert M. Gay Co., New York City.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Tyler Co., The W. S., Cleveland, Ohio.

SEPARATORS, MAGNETIC
Buchanan Co., C. G., Inc., New York, N. Y.

SHEAVES
Chicago Mining Sheave & Roller Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

SHOVELS—Steam and Electric
Ball Engine Co., Erie, Pa.
Brown Hoisting Machinery Co., Cleveland, O.
Bucyrus Co., South Milwaukee, Wis.
Erie Steam Shovel Co., Erie, Pa.
Orton & Steinbrenner Co., Chicago, Ill.
Osgood Co., The, Marion, Ohio.

SHOVEL REPAIRS—Steam and Electric
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

SLATE WORKING MACHINERY
S. Flory Mfg. Co., Bangor, Pa.

SPROCKETS
Weller Mfg. Co., Chicago, Ill.

STACKS
The Reeves Bros. Co., Alliance, O.

STEEL PLATE CONSTRUCTION
Hendrick Mfg. Co., Carbondale, Pa.
The Reeves Bros. Co., Alliance, O.

STORAGE BINS
Brown Hoisting Machinery Co., Cleveland, O.
Neff & Fry, Camden, Ohio
The Reeves Bros. Co., Alliance, Ohio.

STUCCO FACINGS
Metro-Nite Co., Milwaukee, Wis.
Middlebury Marble Co., Brandon, Vt.
Vermont Milling Products Co., Fair Haven, Vt.
Brown Hoisting Machinery Co., Cleveland, Ohio.

SWITCHES AND FROGS
Central Frog & Switch Co., Cincinnati, Ohio.
Easton Car & Constr. Co., Easton, Pa.

TANKS, STEEL STORAGE
The Blaw-Knox Co., Pittsburgh, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
The Reeves Bros. Co., Alliance, O.
Traylor Eng. & Mfg. Co., Allentown, Pa.

TESTING SIEVES AND TESTING SIEVE SHAKERS
Tyler Co., The W. S., Cleveland, Ohio.

TRAMWAYS
Interstate Equip. Co., New York, N. Y.

TRANSMISSION MACHINERY
Plamondon Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago Ill.

WASHERS, SAND AND GRAVEL
Link Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.

WELDING EQUIPMENT
Oxweld Acetylene Co., Newark, N. J.

WHEELS, AXLES AND JOURNAL BOXES
Easton Car & Constr. Co., Easton, Pa.

WIRE ROPE
American Steel & Wire Co., Chicago, Ill.
Leschen, A., & Sons Co., St. Louis, Mo.
Williamsport Wire Rope Co., Williamsport, Pa.

WIRE CLOTH
Cleveland Wire Cloth Co., Cleveland, Ohio.
Tyler Co., The W. S., Cleveland, Ohio.

Buyers' Bulletin

MANUFACTURERS OF MACHINERY AND EQUIPMENT:—These inquiries are live, up-to-date inquiries that have come direct to us from the individual in each case.

READERS OF "ROCK PRODUCTS":—This Department is for your special help and service. If you do not see what you require advertised in "Rock Products," tell us your needs and we will publish them here. There is no charge for this service.

Canoe Creek Stone Co., Canoe Creek, Pa., write that they desire information and catalogs on complete equipment for a plant to produce about 500 tons of sand per day from a fairly hard sand rock.

Blue Ridge Slate Corp., Esmont, Va., want catalogs and prices on mixers for plastic roofing.

American Gypsum Co., Richfield, Utah, want complete information on wall plaster and gypsum products machinery; industrial railways, locomotives, track, scales for weighing cars, crushers for soft and hard rock, conveying transmission and elevating machinery.

Williams Manufacturing Co., Camden, N. J., advise as follows: "We are interested in buying machines for concrete building blocks and literature on their manufacture."

D. Newton Henson, 359 S. Cannon Ave., Hagerstown, Md., wants a medium size concrete mixer.

USED EQUIPMENT WANTED

Little Piney Sand and Gravel Co., Newburg, Mo., want a second-hand locomotive or stationary crane with beam of 50 ft. to 80 ft. in length with bucket that is designed to load sand and gravel off bar to cars on track.

Atlas Sand, Gravel & Stone Co., Hartford, Conn., advise that they are in the market for a used standard gauge steam locomotive about 15 to 20 tons, Vulcan or Porter preferred, with 150 lbs. pressure guaranteed. Want quick action.

INDEX TO ADVERTISEMENTS